

2001

## **Working for excellence in the e-economy: 2nd international We-B conference**

Sue Stoney (Ed.)

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2ND INTERNATIONAL WE-B CONFERENCE 2001

PERTH, WESTERN AUSTRALIA 29 & 30 NOVEMBER, 2001



working for excellence in the e-economy

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**P R O C E E D I N G S**

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Prof. Janice Burn



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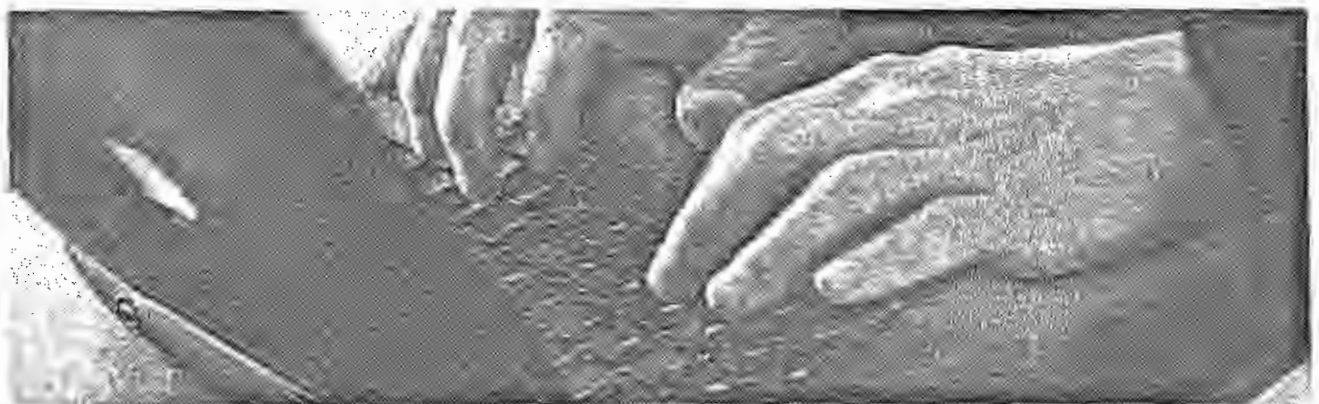
## **"working for excellence in the e-economy"**

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All papers that appear in these Proceedings have been subjected to a blind review by two and three anonymous reviewers.

# FOREWARD

Welcome to Perth, Western Australia, and to the 2nd International We-B Conference 2001 "working for excellence in the e-economy" hosted by the We-B Centre, School of Management Information Systems at Edith Cowan University.

This is an international conference for academics and industry specialists in e-business, e-government and related fields. The conference has drawn participants from national and international organisations.

All submitted papers were subjected to an anonymous peer review process managed by the Conference Committee. Stringent review criteria resulted in an unprecedented number of papers declined this year. Based on these reviews, the final programme was determined. A total of 67 papers were submitted for consideration and 56 were accepted for presentation.

The Conference Committee would like to recognise the efforts of many people who have contributed to the success and support in the organising of this conference and without their efforts the conference could not have occurred. The authors are thanked for their continued support to the 2nd International We-B Conference 2001 and we hope that the conference will receive similar support into the future.

The reviewers deserve a special vote of thanks for their commitment and dedication in having their reviews conducted professionally.

This year saw the launch of our Best Paper and Paper of Distinction award program. Papers nominated for this honour received particularly rigorous reviews. The winners will be announced at the conference.

Thank you and enjoy the conference.

DR SUE STONEY  
Chairperson

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# e-Government: An Australian Case Study

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## ABSTRACT

*This paper looks at the implementation of a new customer value based model in e-government. Firstly the paper reviews the issues of e-government and the drive towards customer centric organisations in the context of a government agency. A model of change is reviewed and extended to the development of a virtual organisation model which can be applied along the customer value chain across multiple service organisations. A case study is used to demonstrate how the concept of a virtual organisation as a value-alliance model can improve customer service within a Government agency. Finally, it examines how the Aboriginal Affairs Department, a Western Australian Government agency is implementing this model as a virtual organisation and the implications of this model for the management of change in a developing e-community.*

*Keywords – e-Government, Customer Focussed Public Services, Value-Alliance Model, Change Management*

## INTRODUCTION

Following on from e-commerce and e-business the latest “e”volution is e-Government. Within the next five years the Internet will transform not only the way in which most public services are delivered but also the fundamental relationship between government and citizen (Von Hoffman 1999). The Internet has become an important medium for organisations desiring to interact with a wide range of stakeholders. With the emergence of the World Wide Web, a totally new business environment is emerging, companies must work together to create online networks of customers, suppliers and value-added process (Ticoll, Lowry and Kalakota 1998). The Internet has the potential to market products and services, to communicate information to a global community to provide an electronic forum for communications and to process business transactions (Fink and Laupase 2000). With few exceptions, however, governments have arrived late on the scene. Transactions with government are rarely a matter of choice and government employees are unlikely to be rewarded for devising innovative web based strategies to replace them in their jobs. Nevertheless the drive is now on for radical government change (Sprecher 2000). A major driver has been the desire to reduce costs and make revenues go further. Savings of 20% are not unusual in the e-business community as they network their supply chains (Burn and Hackney 2000). U.S. federal, state and local procurement spending on materials and services in 2000 was estimated at around \$550 billion, and in the European Union member states’ combined procurement spending was around \$778 billion (Symonds 2000). With a 20% cut in costs we are looking at savings of around \$250 billion.

An additional driver comes from customer expectations. Customers now have far greater access to information and demand personalised experiences as opposed to simply acquiring goods and services. Successful organisations, state or municipal governments and federal government departments and agencies have recognised that developing customer focus is an absolute necessity (Cavanagh and Livingston 1997).

One of the proposed solutions has been the creation of government portals such as the Singapore or UK portals. In reality the government portal acts as a virtual organisation front interacting with customer driven demand. This type of solution requires major changes within and without the government organisation and as yet, there is no clear evidence of success. (Jellinek 2000).

This paper looks at a specific e-government solution in the context of the West Australian Government. Firstly it reviews the issues of customer focus and utilising external organisations in the context of government agencies. It then focuses on Western Australia Government and how the concept of a value alliance network can improve customer service. Finally, it examines how the Aboriginal Affairs Department, a W. A. Government agency is implementing a value-alliance model as a virtual organisation to deliver a service-quality information system.

## **DEVELOPING A CUSTOMER FOCUS**

Prahalad and Ramaswamy (2000) suggest that organisations need to “create their future by harnessing competence in an enhanced network that includes customers”. They developed a three-stage model which we have adapted to a government context and summarised below in Table 1.

Table 1 shows that the idea of extending the government services network and changing the nature of its usage to improve core competencies is a central component of this model. In the past, most government agencies have had a traditional focus and where they have embraced the concept of the extended enterprise they have been primarily concerned with alliances, networks, and collaborations among other agencies and services. The old idea of the “extended enterprise” should give way to the idea of an enhanced network of traditional agencies, other services, funding bodies and customers. Government managers need to recognise that consumers are a source of competencies. They must focus on developing relationships with the customer as the agent that is most dramatically transforming government as we know it and leading the e-government and governance revolution.

	<b>The Agency</b>	<b>Network of Organisations B2B</b>	<b>Enhanced Value Network e-Government</b>
Unit of analysis	The government agency	The extended enterprise:- the agency, other service providers and customers	The value alliance:- the agency, its partners, other service providers and its customers
Resources	What is available within the agency	Access to other service providers competencies.	Access to other agencies' competencies , as well as customers' competencies and investments of time and effort
Basis for access to competence	Internal agency-specific processes	Privileged access to organisations within the network	Infrastructure for active ongoing dialogue with diverse customers
Added Value of managers	Nurture and build competencies	Manage collaborative partnerships	Harness customer competence, manage personalised experiences, and shape customer expectations
Value creation	Autonomous	Collaborate with partner organisations	Collaborate with partner organisations and with active customers
Sources of managerial tension	Service-unit autonomy versus leveraging core competencies	Partner is both collaborator and competitor for value	Customer is both collaborator and competitor for value

**Table 1: Developing Model of e-Government**

## **ACHIEVING A SERVICE DRIVEN ENVIRONMENT**

Many companies believe that a more flexible organisation built around a series of alliances and business relationships, is the most effective way to respond quickly and creatively to constantly changing market conditions (Miles and Snow 1995). The conventional, vertically integrated corporation may be too slow, or have too much retained infrastructure to allow it to compete with companies who can quickly put together a customised response to its clients (Campbell and DiNicola 1997).

The value alliance emphasises the decentralisation of control, the creation of more flexible patterns of working, a greater empowerment of the workforce and the customer, the displacement of hierarchy by teamwork, the development of a greater sense of collective responsibility and the creation of more collaborative relationships among co-workers and customers (Burn and Barnett 2000).

To initiate such developments an agency needs to perform a full customer value chain analysis in order to set up a number of different alliances through an electronic network. This may form the basis for a one-stop portal where the alliance combines a range of services and facilities in one package forming one single customer supply chain. Substitutability has traditionally been a function of efficiency and transaction costs: searching for, evaluating, and commencing operations with potential partners has been a costly and slow government procedure, relying as it does on information transfer, the establishment of trust and policy rules across states, time zones, culture, and legal frameworks. These have determined the relative positioning of partners on the chain and the reciprocity of the relationship.

## **MANAGING A VIRTUAL AGENCY MODEL**

Any business planning must be built on services, delivery goals and objectives that focus on its customers through direct customer input. To achieve this there must be a fundamental shift in management and workforce thinking and practices that include:

- Pervasive knowledge sharing, feedback and communication;
- Integration of environmental considerations at the earliest stages of design;
- Effective partnerships with customers; and
- Commitment to using customer feedback to drive changes in operations, goals and vision.

A key to the success of an organisation is a network of open communication, a combination of sharing and listening flowing through the value alliance.

The following case study serves to explicate this model.

## **CASE STUDY - THE ABORIGINAL AFFAIRS DEPARTMENT (AAD)**

### **Research Method**

The research methodology was based on action research. One of the authors was involved in the development and implementation of the Aboriginal Affairs Department's Heritage Management System.

During the process one of the authors was directly involved in the two committees that were established specifically to steer the development of the system. These committees were:

- The Heritage Management Steering Committee, and
- The Project team.

These committees each have representatives from the heritage management and information management section within the organisation, external consultants involved in heritage management and Aboriginal elders and as such provided an extensive insight into the system requirements as well as ensuring that the system met legislative requirements whilst protecting Aboriginal sites.

### **Background to the Aboriginal Affairs Department**

AAD is a Western Australian State Government Agency responsible for the implementation of the Aboriginal Heritage Management Act which states that all Aboriginal Sites in Western Australia must be recorded and that prior to any development within Western Australia a search of sites must be conducted to determine the impact of development on sites in the area. If sites are to be impacted then the developer must consult with the site custodians and apply to the Minister for Aboriginal Affairs to either destroy or move the site depending on the nature of the site and the type of development.

### **Organisational Culture**

Originally the Heritage and Culture Division had full responsibility for all aspects of Aboriginal sites. The Division was strongly opposed to providing information on Aboriginal sites to mining companies and land developers as they believed that this was the most appropriate way of protecting sites. The manager responsible for heritage management openly labelled mining companies and some Government agencies 'red necks' and was strongly opposed to forming alliances with these organisations and sharing information. This is akin to an IT-Harem where the Islamic word "harem" comes from haram, "forbidden" (Korac-Kakabadse, Kouzmin and Korac-Kakabadse 2000). There was an invisible barrier set up against developers and mining companies that severely hampered their attempts to research Aboriginal sites and progress development.

During a restructure of the organisation the management of the information component of Aboriginal sites was moved to the Information Management Branch. This meant that the Heritage and Culture Division were responsible for providing secretariat services to the Aboriginal Cultural Materials Committee (ACMC) whilst the Information Management Branch were responsible for capturing and disseminating sites information.

## **The Project**

The project to map the Western Australian Aboriginal Site locations and boundaries into the departmental Geographic Information System (GIS) and develop a fully integrated information system began in July 1998.

A working group was formed at the same time to develop policies and procedures for the sites register and for the release of information from the register. These were endorsed by the APMC and approved by the Minister.

The system was designed as a web-based application using Internet technology. The database is linked to the maps of the site locations and boundaries.

## **How The Installation Benefited The Clients**

AAD policy development identified two customer groups - Aboriginal people, and developers. Both groups required accuracy of information about sites, and accurate information on the location of sites. Aboriginal people required protection of information about closed sites, while developers wanted the location of these sites. A compromise was reached, whereby four square kilometre boxes depict the approximate location of a closed site.

Under the old system, clients waited six to ten weeks for site searches to be completed. In the new system, turnaround time for site searches was been reduced to two to three minutes. Additionally large companies are able to download mapping and site index data for inclusion in their own systems.

The system contains maps of sites, resulting in significant improved information on location of sites. Prior to the development of the system the information was stored in a textual database which did not provide for mapping the location and extent of sites.

Organisations that form part of the value alliance include:

**State Agencies** - Main Roads WA, Department of Conservation and Land Management, Waters and Rivers Commission, Department of Resources Development, Department of Minerals and Energy.

**Commonwealth Agencies** - National Native Title Tribunal, Indigenous Land Corporation, Department of Defense, CSIRO.

**Mining and Resource Development Companies** - Robe River Mining, Alcoa, BHP Iron Ore, WMC, Acacia Resources, Packman Mining, Normandy Mining.

**Other Agencies** - Aboriginal Legal Service, Goldfields Land Council, Wesfarmers, AWI Administration Services, Shire of Busselton, APMC

## LESSONS LEARNED

For this alliance to work and for the project to be successful strong trust relationships needed to be developed between AAD and both client groups. AAD needed to take the first step in this process, which was to reverse the basic premise that 'protection meant exclusion to information'. AAD had to be willing to allow their information to be vulnerable. This conforms to the definition that trust is the willingness of a party to be vulnerable to the actions of another party based on the expectation that the other will perform a particular action important to the trustor, irrespective of the ability to monitor or control the other party (Mayer, Davis and Schoorman 1995). From the beginning AAD made a conscious decision to define protection as disclosure of information and to define developers as organisations that inherently want to do the 'right thing', to adhere to legislative requirements and assist with protection of sites. These definitions proved extremely valuable to the project in gaining the trust of developers and in forming the alliances. Trust of the Aboriginal clients was gained through ensuring they had input into the policies and procedures and were the senior decision makers for any changes.

Newell, Scarborough, Hislop and Swan (1999) discuss the importance of organisational control over the design and use of technology when implementing a project aimed at increasing organisational-wide knowledge management processes. From the outset of this project it was determined that a centralised approach needed to be taken to ensure that it succeeded. Prior to the project the management of the Aboriginal sites information had been left to the Aboriginal Sites section with no involvement of the Information Management Branch. Due to lack of coordination, resources and knowledge of managing such a complex system that encompassed mapping, database management, paperbased information management and storage the information collection and dissemination procedures had not been reviewed in over fifteen years. This scenario meant that many requests for information were going unanswered and new site registrations were not being forwarded to the ACMC due to a lack of documented procedures and quality controls.

The setting up of a Steering Committee representative of all stakeholders and knowledge gathering ensured a positive outcome for the project. Attention was given to both internal and external networks, the resources required to tackle the project which led to the development of an appropriate knowledge base. The processes that were followed closely match the five guidelines that Berry and Parasuraman (1997) put forward for developing an effective service-quality information system:

- Measure service expectations
- Emphasis information quality
- Capture customer words
- Link service performance to business results
- Reach every employee

Throughout the project and beyond implementation customer satisfaction surveys were conducted, stakeholder groups were interviewed, the steering committee formed a customer advisory panel and all processes were constantly evaluated and altered as necessary.

Butler (2000) defines Knowledge management as an integrated approach to identifying, managing and sharing of an enterprise's information assets. These may include databases, documents, policies and procedures as well as previously unarticulated expertise and experience resident in individual workers. Knowledge management issues include developing, implementing and maintaining the appropriate technical and organizational infrastructures to enable knowledge sharing. From the outset of the project a fundamental objective was to analyse the process employed by the various staff involved, capture these process and fully document all process involved. This ensured that unarticulated expertise and experience resident in individual workers was captured and factored into the implementation. The system includes technical infrastructures that allow the exchange of knowledge between organisational members regardless of where their office is located within Western Australia. Within the organisation the Heritage Management System stands for a combination of paper based information, electronic information, workflows, utilisation of expertise across the organisation and communication links that enables collaboration to assist in generating corporate knowledge and the provision of services to clients.

Dyerson and Mueller (1999) talk of three building blocks:

- appropriation – retention and effective utilisation of internal knowledge,
- teamworking – integration of diverse knowledge bases and
- learning – acquisition and exploitation of external knowledge



The project undertaken by AAD provides a good example of utilising these three building blocks to develop an effective knowledge management system. The project clearly focussed on capturing and utilising internal knowledge. The analysis of people based processes prior to embarking on the development of the system ensured that the essence of site protection could be captured. This analysis also aided in the reengineering of procedures to provide a better quality service, the establishment of quality controls and the linking of procedures with a modern information system accessible by clients regardless of location. For the first time the Heritage Management System brought together experts from a wide range of fields inclusive of information management, cartographic services, system development, library management, records management, archaeological services and anthropological services. By obtaining input directly from mining companies, land developers and Aboriginal elders the project was able to fully exploit and capture external knowledge and build this into the system, policies and procedures.

Davenport (1999) talks of Knowledge Management, Round Two. He indicates that round one was related to managing knowledge management or capturing information and placing it in one place. Certainly this is what the project has done. Davenport terms stage two capturing the tacit knowledge. From the outset the project concentrated on capturing the tacit knowledge and creating procedures that utilise the essence of this knowledge. The procedures that have been put in place continue to utilise staff from each of the different areas as well as documenting Aboriginal elders knowledge of sites.

Standing and Benson (2000) talk of organisational culture and how cultural change is a critical factor. What makes this system so successful is that the organisation and its staff have a deep commitment to Aboriginal culture and the preservation of this culture. This project would not have been possible without a culture committed to Aboriginal culture and working in the best interest of the organisations primary clients - Aboriginal people.

Moody and Shanks (1999) identifies four broad objectives:

- Create knowledge repositories;
- Improve knowledge access;
- Enhance the knowledge environment; and
- Manage knowledge as an asset.

AAD has tackled the project in such a way as to effectively address these objectives. They have ensured the involvement of all stakeholders, in particular Aboriginal elders and large mining companies at the early stages to obtain 'buy-in' and by doing an environmental scan up front been able to implement systems rapidly whilst not falling into pitfalls that other organisations had encountered.

AAD have developed an infrastructure that clearly supports knowledge work particularly in a geographically disperse or virtual environment.

## CONCLUSION

The concept of a value alliance is used to analyse how AAD streamlined internal business processes and forged external alliances to enable it to develop a system to effectively provide site protection through appropriate and timely provision of information. In terms of internal processes AAD's objective was to ensure all sites were properly defined and added to the permanent register and that clients requiring the information were able to obtain it themselves. The use of direct internet access and the ability for clients to download the data into their systems effectively provides real time access to the information. The Aboriginal clients have benefited by the value alliance working to protect all known sites. By using the world wide web AAD is able to extend its reach to remote clients ending the tyranny of distance especially as the majority of clients are located in remote parts of W.A.

The external linkages provide the ability to deliver site information in real time and protect sites as well as the ability to tap into the expertise and resources of developers in researching and identifying previously unknown sites.

This paper confirms Tan's and Teo's (1997) view that building linkages along a firms value chain is a powerful source of creating competitive advantage and that internal linkages must be carefully designed such that each activity along the process is properly integrated to optimise the use of scarce resources.

There is much research left on the subject of the implementation of the value alliance model in a government agency, especially the distribution of information and communication within the virtual organisation. Managing a virtual organisation may require a whole new set of virtual information leadership skills (Morin, Devansky, Little and Petrum 2000). Storing knowledge and expertise from both partners and customers are also important areas of consideration.

When considering these matters, several questions arise for future research:

How will agencies deal with information and communication that must be passed both up and down, and across functional boundaries, so that close co-operation and team work can be increased?

How can the value alliance store knowledge and expertise and provide this to all members of the virtual network?

How can the alliance capitalise on customer competencies and improve both government and governance?

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# Virtual Government and The Power of an Invisible Hand

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## ABSTRACT

*This paper investigates the interplay between how much leadership a western liberal democratic Government should play in the information economy. Government Online strategies and mantra are examined with respect to traditional political sociology viewpoints that decry limited Government. The investigation seeks to determine if there is a measurable point at which Government intervention turns into interference with the online economy. The higher level question of the role of Government remains in the background as the argument is built. Adam Smith provides some insight into where the line should be drawn in terms of the laws of diminishing marginal utility of involvement. The most problematic area relating to Government involvement in the information economy is the valuations used to predict the amount of jobs directly created as a result of Government intervention to stimulate a sustainable economic development. The results of the interview series across Australian local, state and federal Government, and Government consultants gives an insight into how successful this first tranche of ePublic Service initiatives might expect to be. Government has to decide its role as business partner or facilitator in this IT uptake drive in what is a new combination of private enterprise and bureaucracy, or 'Privocracy'.*

*Keywords: egovernment, liberal democracy, information economy, government online, privocracy*

## INTRODUCTION

There has been a strong push within the past twelve to eighteen months within the Western Liberal Democratic governments of the world to uptake information technology both internally and externally. A typical example from the US State of Utah requiring all state agencies to make their services online within three years through the passing of the Digital State Act of 1999, shows the commitment of government to lead in the online service delivery arena. Australia used the North American through the edict that all Commonwealth departments and agencies produce an Online Action Plan by September 2000.

Government will be required to justify to its stakeholders, the citizenry, why it is investing public monies in the online service sector as it grapples with its role within the new *privocracy*. Legitimation will be borne out of the satisfaction of government as worthy business alliance partner, where traditionally the role was firmly in the non-business bureaucratic realm. The demarcation of private enterprise and public entity begins to blur as government entities attempt to decide and act using business principles and due diligence measures. Perhaps there will be more public spin-offs of private concerns as the business cases are built with strong revenue and cash flow projections.

The underlying objective is for Government to make a significant contribution to strong and sustainable economic growth. Politically, it can be deemed efficacious to beat the new economy drum, while being wary of the Dotcom syndrome of failed experiments. To investigate what is meant by Government providing more integrated services that break down the barriers of Government structure and jurisdiction, the justification for intervention needs to be more solid than simple rhetoric. The statement below amplifies this point.

“*Government Online* will drive the development of a seamless national approach to the provision of online services. Users of these services should not need to understand how Government is structured to interact with it easily and safely”. ([www.noie.gov.au](http://www.noie.gov.au), 2001)

## STRATEGIES

The information economy has been in the conference and academic parlance for only a few years, but in that compressed timeframe it has come to be regarded as one of the contributors to the current sustained period of economic growth. Its potential to expand economic and social opportunities is being rapidly exploited. There is hardly any sphere of activity which is not able to be improved by the online environment—to achieve more, and to do it more quickly and efficiently.

The Australian Government is promoting and supporting the uptake of the online environment, through:

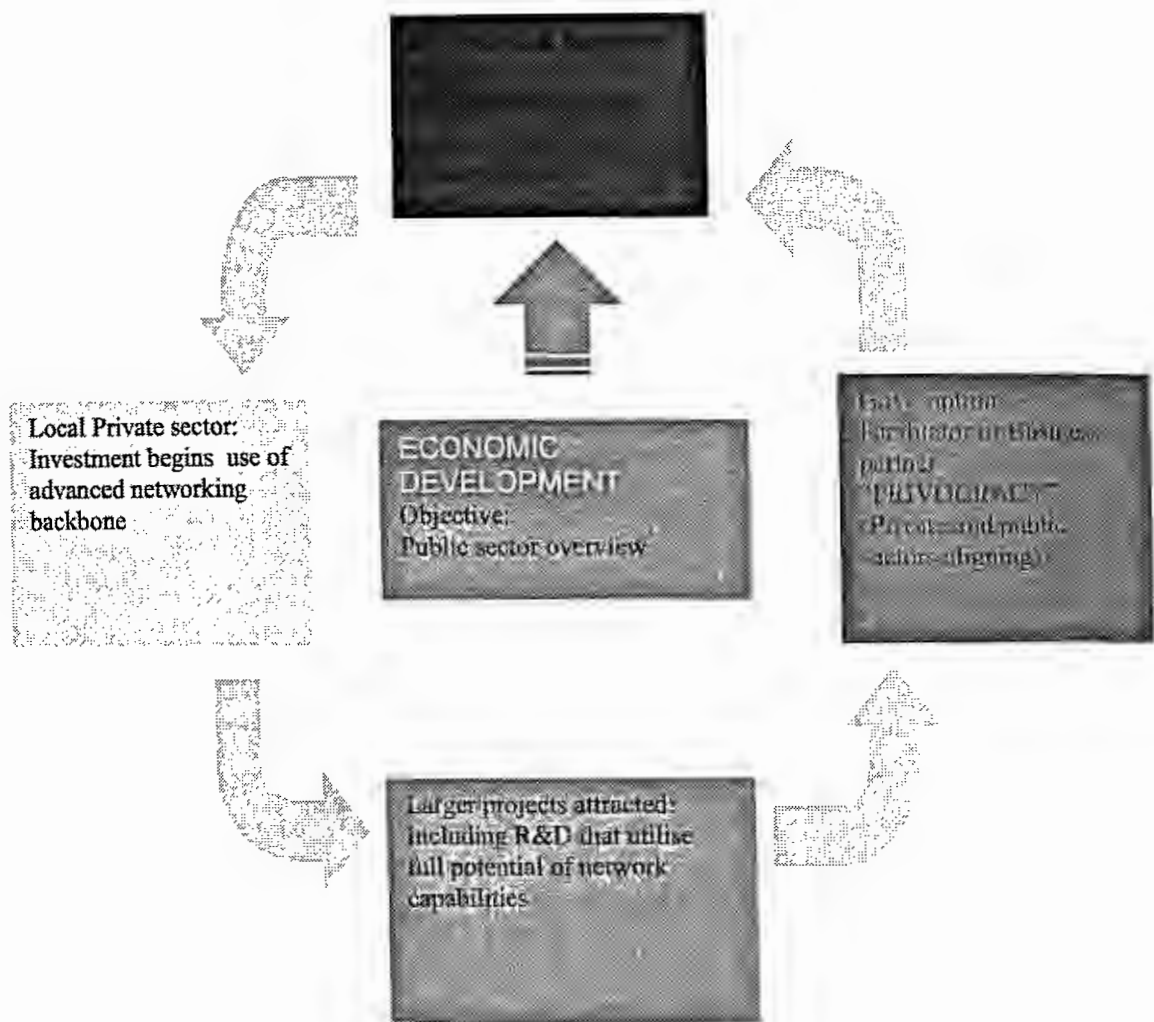
- strong leadership;
- encouraging business and consumer confidence;
- getting key Australian sectors online;
- Pledging increasingly substantial pools of money
- fostering the development of the information industries.

Integral to the Government’s role in providing people with confidence in, and understanding of, the online environment is how well the Government itself makes the online transition.

The Australian Government made a commitment in *Investing for Growth* to show leadership in the information economy by adopting online technologies to provide better services and improve its own business practices. Specific commitments were made to:

- deliver all appropriate Commonwealth services electronically on the Internet by 2001, complementing—not replacing—existing written, telephone, fax and counter services;
- establish a Government Information Centre through the Office for Government Online as a main point of access to information about Government services;
- establish electronic payment as the normal means for Commonwealth payments by 2000; and
- establish a Government-wide Intranet for secure online communication.

Online access to information and services can have a significant positive impact for regional communities, older Australians and the disabled. *Government Online* can address the inequities of regional/rural Australia in accessing Government information and services. It can break down the barrier of distance or mobility that some clients face. Online service delivery can complement and enhance existing traditional service channels for such clients, and provide around the clock access to Government from almost anywhere.



## IDEOLOGY OR JUSTIFICATION

German social thought rejected economic and political liberalism and emphasized the creative role of the state and army. Heinrich von Treitschke, in a popular series of lectures in the 1960s, spoke of

“The army as the concentrated physical force of the nation and its intimate association with the idea of the oneness of the state. An army organized upon lines which accurately express national conditions shows the citizen the realization that the State is one, and that the citizen is a part of the whole”. (Von Treitschke, 1963)

The foundation of the eGovernment motherhood could have origins in such thought. The modern nation state is well equipped to control the means of production and dispersion if it understands how to participate in the information economy.

## THE OLD SCHOOL VERSUS THE NEW ECONOMY

As the Singapore Deputy Prime Minister heralds in the new economy created by the third industrial revolution, Adam Smith maintains that "The expense of making and maintaining the public roads of any country must evidently increase with the annual produce of the land and labour of that country, or with the quantity and weight of the goods which it becomes necessary to fetch and carry upon those roads". (Smith, 1776) If the explosion in the Infocom business is to be believed, then the creation of wealth and economic growth are to be the backbones of the statement made by Smith. It is widely held that the key source of wealth creation for individuals and countries in the new economy is the possession and control of knowledge and acquisition of skills.

Government intervention can enhance or hinder the natural movement of resources and capital toward the upskilling of its population through its public policy. In Australia, the Prime Minister's vision of driving the country toward the head of the smart-crowd (pouring a measured amount of the IT elixir into each person's cup) is being pursued through several federal government departments, but primarily through the Department of Communications, Information Technology and the Arts (DOCITA). The commonwealth government is aiming to build on its leadership role in electronic service delivery. The strategy provides a framework to fulfil the Prime Minister's 1997 *Investing for Growth* commitment to ensure all appropriate government services are available online by 2001.

For countries to prosper in the New Economy, three requirements are essential.

### Good Infrastructure

Heavy investment in education and research and development

Acceptance of the concept of creative destruction to replace old business models and practices.

The justification for this stance is questioned by the fact that the DCITA uses media release statements such as the following to cast its equitable online net to the majority. "The Government is committed to developing more and better services online. The strategy is an evolving, interactive online document. It has been built online, launched online, it will live online, and it is open to online input from all Australians". ([www.dcita.gov.au](http://www.dcita.gov.au))

The deficiency here involves access to services. Only those who own or have reasonable access to an Internet-enabled computer are participants. The majority of Australians are therefore excluded from this online participatory democracy.

An Australian Bureau of Statistics report (2000) showed computer use has continued to grow steadily, rising from 49% of businesses in 1993/94 to 63% in 1997/98 and 76% in 1999/2000. The relevant statistic, however, between 1997/98 and 1999/2000, the proportion of businesses with Internet access has almost doubled (29% to 56%) while the proportion with Web sites or home pages has more than doubled (6% to 16%). The personal computer (PC) penetration usage for businesses in Australia

Fink (2000) By focusing on a broad range of nontechnical elements early in the adoption of Internet technology, past mistakes can be avoided. In this context of Smith's statement below, government has to evaluate its rationale for taking the leadership role in disseminating an electronic edict internally and to the nation.

"The strength of a bridge must be suited to the number and weight of the carriages which are likely to pass over it. The depth and the supply of water for a navigable canal must be proportioned to the number and tonnage of the lighters which are likely to carry goods upon it."(Smith, 1776)

Smith informs us that Government should not be taking the lead role in these tasks without a sound justification and feasibility confirmation as to the scale and scope.



“A magnificent high road cannot be made through a desert country where there is little or no commerce, or merely because it happens to lead to the country villa of the intendant of the province. A great bridge cannot be thrown over a river at a place where nobody passes, or merely to embellish the view from the windows of a neighbouring palace.” (Smith, 1776) It seems that government, for whatever reason is destined to continue to ramp up its online service delivery even when benefits realisation studies may point to reasons to not pursue certain strategies.

## **BITS OR A BIT TOO LITTLE**

The way Government evaluates when, how much, and into which areas its budget should be channeled should be dissected. It is contended that a minimum level of rigour be applied to the analysis, so that the decision, when made, can lead to the right amount of funding to the right areas. Government can severely overcook and undercook the eSociety push by either

spending too little in a highly diverse target, or by

spending too much in too focussed an area.

The second round of Building on Information Technology Strengths (BITS) funding that was made available year end 2000, is a case in point of the way in which Government has decided to cook its eCommerce goose. In an attempt to promote innovation and commercial success in the information industries, the Government launched the \$A158 Million BITS program.

The program has the objective of encouraging new high technology firm creation and growth, and has been modelled on the Canadian Canarie program which seeks to inject over \$C2 Billion into building the Canadian backbone statewide. Government instrumentalities in the United States are not looking to divert their budgets into social security anytime soon either. Gartner Dataquest predicts Government agencies in the United States will spend more than \$6.4 billion on e- Government solutions by 2005. (Sood, 2001)

The BITS fund uses 16.6% of the once public telecommunications provider, Telstra which was publicly offered in 1998. Breakdown of the 1999 funding consisted of:

\$78m used to establish incubator centres for small to medium enterprises in the IT&T sector;  
\$40m to fund test-beds, experimental networks and other information infrastructures; and  
\$40m allotted to Tasmania for the 'Intelligent Island', to develop further an internationally competitive IT&T sector in the state.

To investigate the incubator rationale, the flavor of this earlier round of funding revolved around applicants offsetting their capital expenditure requests with private investors whom would support the project. The incubator centres money attempts to provide a hub of support and information for new and growing firms. Incubator justification suffers from the paradox of attempting to help start up firms establish themselves commercially, whilst providing cheap rent to 'mature' start-ups who, over time, rely heavily on the subsidised rent relief, with no intention of vacating their lease space. The Project Manager has to grapple with returning high occupancy rates to the committee to justify the demand for the incubator while attempting to remain faithful to the objectives and strategic intentions of the program.

For the second installment of BITS, which closed in December 2000, the focus was on the Advanced Networks Program (ANP). The program has the high level objective of underpinning the next generation of the Internet, which is essentially connectivity. High capacity networks are needed in areas such as telemedicine, which includes real-time medical diagnosis, simulation software, advanced manufacturing, e-ducation, post production in the film sector, and assisting collaborative advanced projects across the research community.

Government believes that it has a legitimate role within the demonstration of advanced communications networks, experimental networks and test beds. The Australian Prime Minister, John Howard delivered a politically timely announcement to the public in late January, 2001 that sets aside up to \$A3 Billion to developing the information economy through a package of numerous information technology initiatives. ([www.pm.gov.au](http://www.pm.gov.au))

Development of advanced networks such as Internet2 in the United States, and CANARIE in Canada, clearly demonstrates that cooperation between Government and industry can contribute to the growth of advanced networks and the establishment of national backbone networks.

### **AS SIMPLE AS 1-2-3**

Down at the ground level, the most popular self-service eGovernment applications that involve transactions of real value with members of the public tend to be web-based systems which allow easy payment mechanisms and a basic transactional relationship with the Government department chosen. Innovators and early adopters in the public sector space are attempting to prioritize which of their services are easily portable to the web, and which may need more time and organisation for this transfer to occur.

Technology vendors are viewing this awkward public sector market with caution while realizing that potential ongoing relationships will provide them a future constant cash flow. The problem for vendors weighing up these new market opportunities is that they have a tendency to suffer from over-promising and under-bidding. New, ever complex systems are being developed for this insatiable public sector client which is beginning to increase its IT budget with respect to planning for new IT initiatives, as well as IT Capital expenditure programmes. The new applications are supposed to deal with the range of problems that these e-public service customers are confronted with. (Symonds, 2000) The controllers of these budgets feel justified in their expenditure patterns and consumption of new "critical" applications.

The government instrumentalities can easily get caught up in a game of issuing expressions of interest (EOI) often after taking a sample of advice from consultants. This cycle often begins because the government function lacks the eBusiness understanding of what it actually requires from an IT solution. It may bounce around from face-to-face meetings, some internal desktop research and possibly a focus group or two to come up with a specification of what it requires. The consultants and vendors are furiously attempting to embed their preferred solution and methodology at this stage. Invitation to tender, though being further down the track, should not be automatically assumed as a better understanding of requirements. The interviews provided some answers in the area of how senior decision-makers see their role in shaping the information economy.

## INTERVIEWS WITH GOVERNMENT PARTICIPANTS

Over a 2-month period late in 2000, a series of 45-60 minute qualitative interviews were conducted using a sample of 8 high-ranking office holders. From each of the categories of local, state and federal Government, two participants were sought. A further two senior consultants to Government, each with at least 20 years of experience across all three authorities were also invited to participate. The methodology included a set of open-ended questions in a prompted environment that investigated where the respondents thought the role of Government should begin and where it should end in the context of the information economy.

The responses gave a strong indication to the interviewer that government has some sort of defining and leading role to play within the information economy, firstly as collector and disseminator of certain types of information and services. Government was seen, for the most part, as being the facilitator in this emerging information economy, from the point of view that electronic methods of communication are still relatively infantile. Government was identified as having a role in nurturing the community, whether business or social to a stage where momentum allows for sufficient understanding and use. As this first wave of mass electronic communications allows for government to citizen dialogue and transaction, issues like education and appropriate methods of use and maximum utility are still a heavy priority for polities interested in upskilling their population. All interviewees agreed that government involvement at this level should be a high priority across all three levels of government.

The stickier points asked of the respondents centered around the 'what and how' of government involvement. Issues discussed included the collection and storage of personal and private information; the inter-agency sharing of confidential personal information; and the access of non-government agencies requesting to view private information. Consultants to government seemed quite happy to accommodate the fact that certain agencies were expanding their role into online service delivery.

Quite clearly, the majority of these senior government officials saw it as their duty to be involved in promoting the benefits of the information economy. There appeared to be no real moral dilemma of the suitability of government to be involved at the forefront of legal, content management and infrastructure controls for the information economy. Some even claimed that government should be setting the agenda, within which industry should only be a participant. The majority however argued that sound strategy would occur when a collaborative approach is adopted utilising the expertise of industry, government and community alliances. The launching of the e-Government project in the United States in 2000 reinforces this view by two members of opposing parties. Lieberman and Thompson launched the website designed to enable citizens to help shape legislation, and indirectly, the future of electronic government. Electronic forms allow citizens to send comments and suggestions on the subject of e-Government to the committee. (Matthews, 2000)

Lieberman on the participation of citizenry. "We are extending an unprecedented invitation to any interested citizen to participate openly and interactively in the process of writing legislation." The Web site "invites every member of the public to what is an extended question-and-answer session" on e-Government issues. Public participation is expected to influence the shape electronic government takes as it is formed". (Matthews, 2000) The point of this type of collaborative interactivity is to reinvigorate public participation in public policy. The medium is used as a means that further entrenches the role of Government within the information economy. Examples such as this do not seek to question the legitimate role of Government within this new economy, but rather show that polities feel it is their divine right to be not only involved, but at the forefront of being team leader of the process. In the American context, a Government suffering from issues of citizen trust intends to embrace and incorporate any reasonable public comment that is in line with the path it is trying to lead its membership toward.

## CONCLUSION

As government officials seem to be scrambling to rest their policy platforms on anything with an “e” in it, the question of legitimate right to steer the economy and polity over this distance and with such velocity has not been addressed by writers. Britain's Prime Minister, Tony Blair, sees the Internet as crucial to the modernisation of government. Even so, the underlying legitimacy remains unquestioned. On the surface, these types of statements appear quite plausible, and for the most part, believable, but fail to respond to questions of why governments are involved in the first place.

If the von Treitschke version of the unified state is taken as a reason, then nation states uncomfortably fit under the liberal democratic banner. Notions of control, manipulation, and conformity under the banner of unison taint the laissez-faire edicts that have long been endeared to Adam Smith and the invisible hand guiding the economy. If government is considered a facilitator and not a doer by definition, due to its sensitive position as keeper and conservative spender of public monies, then can it not be argued that industry is better equipped and a more appropriate rudder of the information economy.

Further research might explore this new collaborative approach to information economy ventures in the marketplace that rely on a balance of control, expertise, guidance and adjudication. Literature suggests a strong pre-occupation of government policyholders globally scrambling to be associated with anything in the “e” space at present. What began as a small trickle out of public purses and was actually quite difficult to extract has now turned into a gushing pump.

Government needs to be aware of the lessons of enterprise experiences in the ephemeral Dotcom era, where rationality and solid business cases were dismissed in many cases. Investing in the information economy as far back as 1998 meant that thorough due diligence could end up in a proponent missing out on a deal. Governments flush with public funds have to be aware that history still has a tendency to repeat itself. In the case of e-years, the cycle just happens to come around sooner.

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# The Dominant Knowledge Asset: The Key to Short-Term Decision- Making

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## ABSTRACT

*This paper examines three current military decision making tools for business use, while being aware of Information Warfare and Attack: dominant Battlespace knowledge (DBK) or The knowledge asset, decision making using the linear OODA Loop (Observe-Orient-Decide-Act) and decision systems using the non-linear Complex Adaptive Systems (CAS). The OODA Loop links two possibly incompatible elements, DBK and CAS into a superior decision making model that makes the short-term unit of decision based not on cost but timeliness to yield the value of the decision. The intention is to maintain proactive initiative and momentum, and ensure the agility of the organisation to almost any unforeseen event.*

*Keywords: Information Warfare, dominant Battlespace Knowledge, OODA Loop, Complex-Adaptive Systems, Agility, knowledge assets.*

## INTRODUCTION

This paper will examine the civilian uses of the military ideas of Dominant Battlespace Knowledge (DBK), OODA Loops and the use of Complex Adaptive Systems. This is done by discussing the question: How can these topics be made more applicable to business using a single model that links possibly incompatible elements to form a model of superior short-term practicable decision making?

These military techniques as applied to business, rely upon communications technology to perform several major functions –

To know more about your markets than all of your competitors, anywhere;  
To exploit the major and minor weaknesses of the competition;  
Internally, to make every member of the organisation more 'aware' of their value and the purpose of their cohesive relationship with all of the organisation's leadership and all of the groups within it;  
Internally, to explain to every member of the organisation how their daily experiences coupled with their trusted efforts and training adds to and creates the knowledge assets of the organisation. And, how this supports the current business direction by adding to the current knowledge asset that will be used by everyone on a day to day basis.

There are corollary points as well:

To ensure 'surprises' become profitable.

To 'foster' the incompatibilities between knowledge creation and decision making, in order to force an 'edge of chaos/destruction' superior creativity.

## LITERATURE REVIEW:

### OODA Loops

The OODA Loop in its original context was for use by individuals in one-on-one aviation combat in Korea: *Observe-to collect and analyse the data*, *Orient the information to our purposes*, then *Decide how to utilise the knowledge gained*, then *Act*.

The OODA Loop is linear and time dependent and can be used by individuals or by groups. The purpose of the OODA Loop is use the available information and knowledge to reach a series conclusions quickly and thus to reduce the time taken to reach a decision that works. The speed of the process positively affects the probability of a 'winning' conclusion, even if the original decision was a 'bad' one, as another decision can be quickly made before the opposing side completes its reaction to our mistake.

For example if side A has half the OODA cycle time of side B, side A will prevail, as side A can parry (successfully defend) and reposit (counterattack), while side B can only attack once.

Shay ( 1998 pp.1-6) recognises that for an organisation to utilise the advantages of the OODA Loop, it must build trust with the individuals that *are* the organisation. He states 'Trust frees cognitive and motivational resources for all steps in the OODA cycle.' This leads to his conclusion that 'cohesion, leadership and training creates this trust from people who start out as strangers'. But there has to be advantages to having a speedy decision-making model, and these are grouped as corporate agility. Richards ( 1996 pp.1) defines agility as the 'time derivative of manoeuvrability', the speed at which an individual or organisation can radically change direction.

However, there is a danger in using fast cycle-time strategies, namely that the fast-time response may be used reactively not proactively to current events. Richards ( 1996 pp.2) quotes from a Japanese Samurai, Musashi, 'If you consciously try to thwart opponents, you are already late.' In another article, he quotes other various military disasters as examples to support another Musashi argument that the reasons why these particular catastrophes occurred are that '...a strong defense concedes the initiative to the opposition and that reaction may avoid defeat, it rarely delivers victory' Richards ( 1998 pp.4). Fast reaction times are to gain and maintain the initiative, to maintain 'an advantageous rhythm...' Richards ( 1998 pp.6) and to support organisational agility.

Though these sources are predominantly military, the application of a system that uses decision making skills, that yield speedy workable options from people who are trusted and valued is a requirement to today's modern business environment. In particular, where a flexible defensive position seems to be the only option available in today's Information Warfare environment.

## Dominant Battlespace Knowledge (DBK)

Almost all literature in this area comes from the American military and its resources and originates from one source Johnson and Libicki ( 1996), (a review is found at Van Nederveen ( 1997)). The main argument is that organisational size is not overly important in order to win a conflict – ‘...the pattern of engagement can favor the DBK-rich side; initiative need not rest with the side with the greater firepower.’ Johnson and Libicki ( 1996 pp.35) The aim of DBK is to ‘maintain the ability to understand what we see and act upon it decisively’, this quote from General Rokke in the forward of Johnson and Libicki Johnson and Libicki ( 1996), is the definition of DBK used here.

This leads to a conclusion that these fundamental directions of DBK are applicable to businesses of any size that has knowledge assets that are actively utilised.

Knowledge assets tend to be volatile and can evaporate quickly over time, so time-critical collection decisions to maintain the asset’s dimensional power and size are made constantly to support the decision-making ability of the organisation. Because knowledge is volatile this means that the knowledge asset must be at least slightly ahead of the decision makers in its library collection function, but also it must be more agile than the decision making functions, as it must have the capacity to ‘jump’ to a new position, not merely turn towards a new position.

Though one is apparently discrete and the other mostly continuous, there are compatibilities: *to learn about* and *to see* are common parts of the OODA Loop and dominant knowledge. Where the OODA Loop is a process, DBK is the means of information and knowledge supply, from the utilisation of the developed ‘senses’ of a business’s operations. However, the final interpretations, to decide and act, are left to another sub-organisation, which is probably best served by a non-hierarchy, a Complex Adaptive System, to ensure that the DBK is able, elsewhere, to freely function as a guide to the available options, at a given time and place.

## Complex Adaptive Systems

Complex Adaptive Systems (CAS) are a new approach to decision-making that stresses the non-linearity of the real world Alberts and Czerwinski ( 1999 pp. xiii), and they try to explain uncertainty in the real world. Basically, CAS is a holistic, non-linear and ‘whole view’ of what effects a single decision has on the whole organisation as well as a source of problem resolution within a given time frame. The time frames used are the immediate or *clear*, the intermediate or *complicated*, and the long-term or *complex* Maxfield ( 1999 pp. 198-201). The use and purpose of a CAS is replace guesswork with common financial and logistic or both, tools, coupled with a very flat organisational structure.

As a CAS is a non-linear feedback network, the adaptive part means that, in a manner of speaking, a CAS also ‘learns’ from past inputs Stacey ( 1996 pp. 2-3). Noting also -- ‘Perhaps the major insight coming from complexity science is ...nonlinear feedback networks are all creative...only when they operate at the edge of system disintegration.’ Static situations cannot possibly be a CAS, and logically a plan cannot describe a CAS, so a plan is not logical within a CAS, but planning and budgeting are, as they define the boundaries of the possible.

Briefly, Complex Adaptive Systems (CAS) have a definition and ‘four major properties of the aggregate dynamics that set them apart from other systems’ Maxfield ( 1999 pp.175-179) and Pascale ( 1999 pp.3).



Pascale describes the implementation of CAS to Royal Dutch Shell Group, using the four 'bedrock principles of CAS' which are:

Equilibrium equals death.

Complex Adaptive Systems exhibit the capacity of self-organisation and emergent complexity.

Complex Adaptive Systems move towards the edge of chaos when provoked by a complex task.

One cannot direct a living system, only disturb it.

The equivalence between a living 'system' and a CAS is the foundation argument of these systems. Besides the principles of CAS, a CAS must pass four tests Pascale (1999 pp.2):

It must be comprised of many agents acting in parallel. It is not hierarchically controlled.

The organisation is constantly moving these agents to create structures.

It must be fed with energy otherwise it winds down; CAS are vulnerable to death.

All CAS's show a capacity to recognise patterns and use this skill to anticipate the future.

CAS has everything to do with the ability of the organisation to develop a flexibility and empowerment of people to utilise the data and information gained into workable knowledge to resolve the presented problem, with perhaps newer methods not thought of before Gell-Mann (1996 pp.11). These newer methods are the critical needs that a CAS can supply without the 'baggage' of an hierarchy, which can turn an organisation against itself if a newer method does not have the 'stamp of approval' of the hierarchy. The advantage of a CAS is the fact that the CAS offers organisational 'ownership' of an idea rather than hierarchy approval and this leads to the advantages of individual ownership as well.

The OODA Loop has the common points with the CAS of the ability *to decide* and *to act* upon that decision. However if we hold to the description of an OODA Loop as a process, the CAS is a 'synergism' of creative assessments that is meant to yield workable solutions quickly, using the entire knowledge resource found within the CAS, again at a given time and place.

## **DEVELOPEMENT**

### **Using the knowledge asset**

To be the possessor of dominant knowledge asset, whether in business or in a military situation also implies the possession of business or battlefield dominance, that is, the ability to carry out the decisions made using this asset Johnson and Libicki (1996 pp.69). However, the mere possession of a dominant knowledge asset is not enough to secure success. It must render value in excess of the costs of acquisition, and as with any asset, and it must be able to tailor a force to meet an unforeseen event Johnson and Libicki (1996 pp.63).

The consequences of this asset losing value, being used as a reactive tool, or having it directed to the 'wrong area' or dimension is discussed in the military sense Schmitt (1999 pp.237-239), Richards (1998 pp.4) and Bunker (1999 pp. 56) but this has real implications for business.

An example Pascale (1999 pp.4) was the dominance of IBM in the mainframe markets for so many years. This did not happen by accident, as IBM spent large amounts on market research outside and within its own organisation, it was not then called developing dominant knowledge but 'marketing'. Later, with the rise of the PC, the apparent location of the overall marketplace had moved, but IBM's dominant knowledge asset did not. However, IBM was not alone. It took years for the American Automotive Industry to respect the products of the Japanese automobile industry, even as their 'Battlespace' was shrinking to the Japanese expansive and proactive offensive into the American car industry's own 'God given' backyards.

Information superiority leading to dominant battlespace knowledge or the dominant knowledge asset, does not indicate absolute information/knowledge superiority, it only means that one side has or can collect more and better data than the other side at a given place and time. From this, we can conclude that the organisation that more effectively supports and builds upon the knowledge assets it already possesses and has the organisational flexibility to best use these resources is in the very best position to win. The organisation that does not possess dominant knowledge, but is better organised to utilise the knowledge it has, is probably in a better position than an opponent who has such an advantage, but lacks the organisational flexibility to use it.

## THE MODEL

'The OODA Loop appears wherever a decision or action is needed...' Marsh (2000 pp.3), and it is presented as a linear flow from one point to another. However, I posit that the OODA Loop is a discrete two-part concept with a linear relationship within and between the two parts. The first part is 'Observe and Orient', a sourcing and perception function of the available data (the DBK), which requires continuous data collection and its transformation into business and industrially valued information that can be evaluated into knowledge. This leads to the second part, that is, to 'Decide and Act' which is a discrete function of the given organisation. The OODA Loop provides the conceptual link between the two possibly incompatible organisational functions.

Also neither the DBK or a CAS are in a static/'wait' state, as they are in a state of constant interactive motion as DBK has a relationship with a varying CAS. In the end CAS determines the construction and content of the DBK.

The object of the model is to create and support an agile competitor using the concept of the fast linear decision-making OODA Loop. This is done by using information and knowledge sourced from the firm's knowledge asset and putting the evaluated options in front of the organisation for further evaluation so the organisation can effectively exploit its earned time and knowledge advantages.

The diagram below shows how the OODA Loop has a relationship with both Dominant Battlespace Knowledge/knowledge asset and with Complex Adaptive Systems. DBK maintains the information flow, while CAS provides a decision-making system, which also determines the need, time, manner and place of the collection of data. This link is the dotted line between the CAS and the DBK. Noting that there are three time descriptions using CAS, that is *Clear* (within 24 hours, a clear terminal date), *Complicated* (within days or weeks, sheer number of choices), and *Complex* (tenuous connection between actions and results-emergence, perpetual novelty and ambiguity) Maxfield (1999 pp.198-201). The OODA Loop is seen to operate only within the *clear* time frame, as the other time frames can create unsustainable loads upon the decision-making practices.

The model functions are described below, and it would not be unusual for several hundred or thousand of these models functioning at the same time within an organisation. We are not concerned about what sort of problem we have, only that we have a problem that relatively speaking must or should be quickly resolved.

The first assumption is that the DBK/knowledge asset is also under attack at the same time the problem arises. If proven not to be so, then 'clean' information/knowledge is obtained to formulate an orientation of these processes to yield options based upon considered current knowledge resources. If the DBK is suspect because of an attack, then the whole DBK is acknowledged as 'suspect' and is ignored in part or in whole, with the DBK/knowledge asset goes into a 'rebuild' phase, while at the same time, options are being sourced elsewhere.

The options are then received and evaluated. If the options are based on reliable information/knowledge, the CAS system may yet add to the options available. However, the CAS may also ignore the options presented, or it may reject the options presented and ask for more information/knowledge accompanied by more current options and the loop begins once again.

However, this can create a serious danger. If the decision is delayed by the unreliability of the DBK/knowledge asset, this increases the risk of having to implement a larger decision with the same or even lesser amount of reliable information. The CAS may determine that the DBK be ignored and the training, leadership, and group cohesion within the CAS carry the day, as the CAS goes into an intelligent 'gut feel' mode. In any event, the final decision is borne by the CAS. Perhaps the United States Marine Corps '70% solution' Forbes ( 2000 pp.1) is the answer, that is, a decision is made when the DBK/knowledge asset can supply 70% of the 'needed' information/knowledge to ensure speedy and effective decisions. This means that even if the decision is wrong, it is a small 'wrong' which is better than waiting for more information and finding that the needed decision has changed into a risky and large, time critical judgement call.

Another reason for the model is to promote 'Agility', the ability to move from one extreme to another, very quickly and economically.

Even with the best information available, not all options will be the best, but options *are* available for management to act proactively, which is a better situation than having no considered options at all.

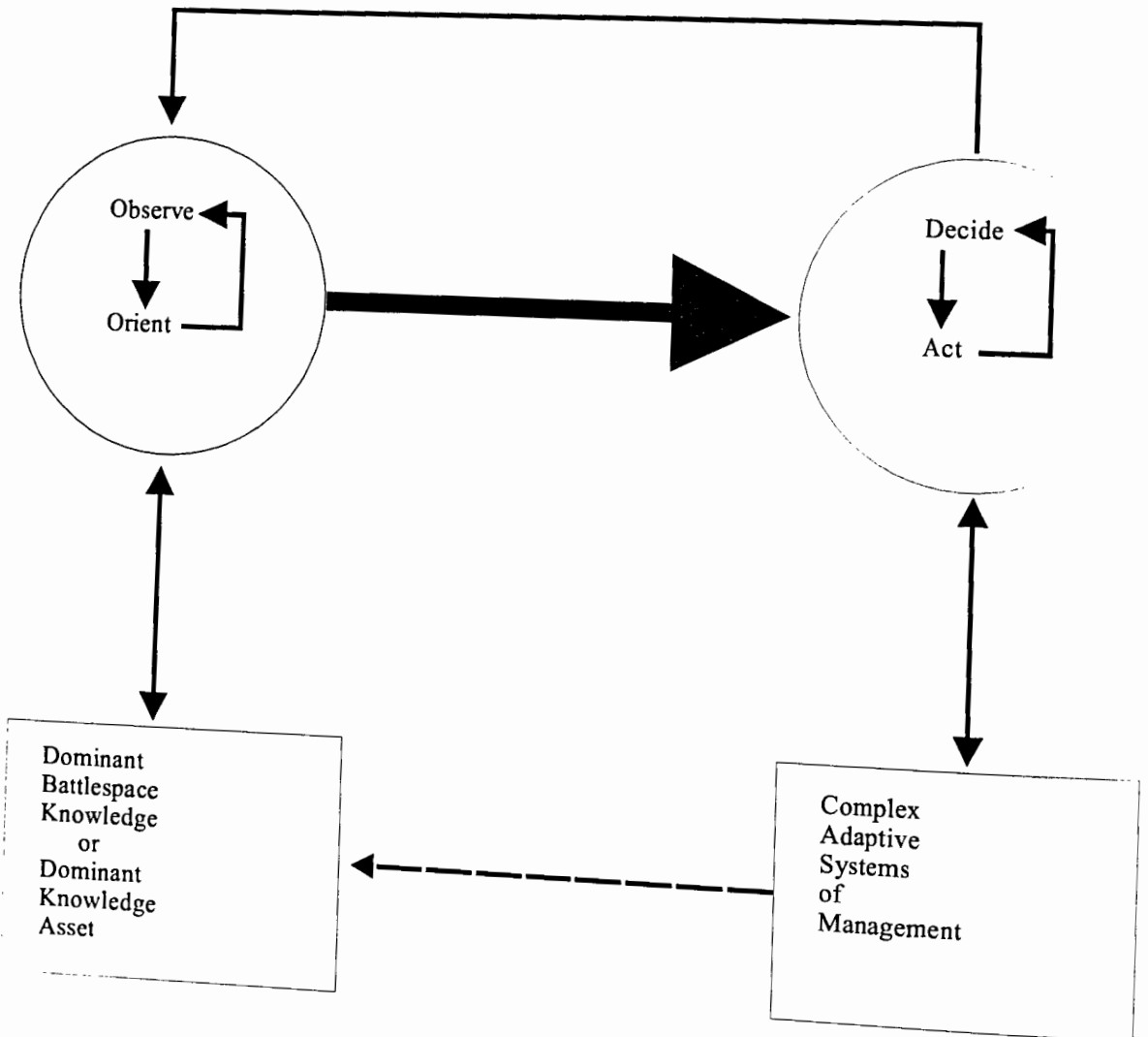


Figure 1: Decision Making Model

The implied role of DBK/knowledge asset is to supply needed data as information and knowledge to the OODA Loop as required. In order to do this the collectors must collect seemingly endless amounts of data and collate this data into information and knowledge, and then have it available almost instantaneously, whether relevant at the time of collection or not. An Information Attack-- delay, disruption, denial and deception of the knowledge asset resources is only part of the security problem. The defending organisation must be able to defend itself against multiple attacks and attackers hostile to this key resource, and the defense must be commensurate with the resource's value. However, if this resource collapses or becomes unreliable, the organisation may yet prevail in spite of the corrupted information resource. It would be prudent to train for such circumstances, as there is the option of not making a decision at all or using the ultimate fall-back position ' Management is the art of making irrevocable decisions using inadequate information'; the two options are valid, but not very comfortable stances.

There is another management option, and that is to foster the incompatibilities between the knowledge asset and the CAS. This forcing to the edge of chaos/destruction is shown to make a CAS even more creative when faced with a complex task with or without knowledge assets.

## **CONCLUSION**

We have seen the processes that make the model workable, and that the model aids in helping an organisation to become agile in respect to the time taken to make a decision. Now the management question to be answered is how much information and knowledge and resources do we need to resolve future problems and not what the 'Plan' allows us to do.

## **FURTHER RESEARCH**

Perhaps the OODA Loop can be considered a three-step process, Perceive, Evaluate and Act - Perceive the whole picture and evaluate this picture with options that can be quickly acted upon.

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# Researching the Adoption of E-Commerce and the Internet by Older People

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## ABSTRACT

*Many older people are discovering the Internet, and some are making good use of electronic commerce and all that goes with it. Other older people, however are happy with how they have always done things and are not adopting these technologies. This paper questions why some older people are prepared to adopt Internet technologies while others are not. It offers a research perspective, based on actor-network theory, for investigating adoption of e-commerce technologies by older people. Innovation translation presents a different view of innovation than the better known theory of innovation diffusion, but one that the authors argue is better suited for research in socio-technical situations like this.*

*Keywords: Innovation, translation, older people, electronic commerce, the Internet, actor-network theory*

## INTRODUCTION: OLDER PEOPLE AND THEIR USE OF ELECTRONIC COMMERCE

Figures from the Australian Bureau of Statistics indicate that older people (55+) are taking up Internet technology at a very rapid rate, but that their use of the Internet for electronic commerce (e-commerce) activities remains very low with older people forming just 1% of the total of adult Internet shoppers (Australian Bureau of Statistics 2000). Older people, due to the ageing process, have particular needs that differ from younger people. As people grow older they can become physically less mobile and could benefit if they were able to conduct more of their financial affairs, such as banking and bill paying, from home. The research literature (Williamson, Bow and Wale 1996; Council on the Ageing 2000b; Mitchell 2000; Lloyd 2001), and also data from an Older Person Focus Group in Melbourne (Council on the Ageing 2000a), reveal significant barriers to the adoption of e-commerce by older people. This paper will outline a research approach for investigating the adoption of e-commerce, and its associated technologies, by older people.

E-commerce can be defined as the purchase and sale of information, products and services using any one of the thousands of computer networks that make up the Internet (Lawrence, Corbitt, Tidwell, Fisher and Lawrence 1998). Typical e-commerce activities include on-line banking, purchase of goods, purchase of services such as insurance, arranging and paying for travel and accommodation, on-line share purchase, soliciting investment advice, and the use of automatic teller machines (ATM). The global interconnection of computer networks we know as the Internet (Stroud 1998: 293) is a key component of most e-commerce transactions. Hannon (1998: 6) suggests that the most important Internet services in this context are e-mail and the World Wide Web (WWW), which he defines as a collection of Web pages, or electronic documents, which hold a variety of data including text, graphics, sound and complex multimedia such as video clips. Web pages can also hold hypertext links allowing users to navigate to other Web pages of related information.

During the twelve months prior to February 2000 almost half (43%) of the adults in Australia connected to the Internet (Australian Bureau of Statistics 2000). The highest Internet usage was, as could be expected, among younger adults aged to 18 to 24. 77% of these people made use of the Internet and, in general, they preferred to

do so at sites other than work or home. Of the older adults (55+), only 13% were Internet users and this group, also as expected, was more likely to access the Internet from home. Figures for this period (Australian Bureau of Statistics 2000) show that there was an increase of 260,000 adult Internet shoppers (from 480,000 to 740,000). However only 1% of the total were older people over 55, indicating that older Australians are currently unlikely to be Internet shoppers. The very low uptake of Internet shopping may have some serious implications in the future for government policies aimed at increase the independence of disabled older people (Bishop 2000).

Older people purchase computers for a variety of reasons. Lewis (2001) suggests that their main drivers to buying a computer are the online services of banking, e-mail and convenience shopping, but that when they get the computer their main use is for word processing, e-mail, Internet browsing and games.

## **OLDER PEOPLE AND THEIR NEEDS**

The US-based Spry Foundation (2000) sees the needs of older people revolving around four interrelated themes:

Financial security,  
Physical health and well being,  
Mental health and social environment, and  
Engaging in intellectual endeavours.

Financial security is seen as important by older people who, in retirement, need to be assured of adequate income to maintain their lifestyle. Many older people, in Australia as well as North America, must arrange their own finances and in doing so seek appropriate investment information (Cutler 1997; Manchester 1997).

The Australian Government has recently released a number of issues papers examining the older person's ability to remain active and independent (Bishop 2000). A key feature of these is an emphasis on communication technology, particularly the Internet, that enables older people to use e-mail to communicate with family and friends, access information, and to engage in e-commerce activities such as bill paying, the purchase of goods and services, and electronic banking (Coulson 2000; Fozard, Rietsma, Bouma and Graafmans 2000).

## **BARRIERS TO THE USE OF ELECTRONIC COMMERCE BY OLDER PEOPLE**

The literature, and also discussions with the Melbourne-based Focus Group (Council on the Ageing 2000a), show that there are a number of barriers to the adoption of e-commerce by older people. For those older people without their own computers, limited access to Internet technology through public libraries and community centres is seen as a problem. For those who have set up their own Internet facilities at home, capital costs, running costs and maintenance become important issues (Williamson, Bow et al. 1996; Council on the Ageing 2000a; Human Rights and Equal Opportunity Commission 2000). Lloyd (2001) suggests that the costs associated with buying a computer and getting it on-line are an obstacle to almost 35% of the 55-plus age group.

Knowing how to make use of the technology presents a problem and there is a need for appropriate training at various levels in both basic information technology and in information handling skills (Echt and Roger 1998; Cody, Dunn, Hoppin and Wendt 1999; Hollis-Sawyer and Sterns 1999; Council on the Ageing 2000a; Human Rights and Equal Opportunity Commission 2000). Many older people also have difficulty in searching for the information they require as some Web sites contained complex information that is hard to understand.

Usability issues are seen as a potential barrier with the interface, information structures, and navigation being important contributors. Research reported by Noonan (2001) stresses the link between disability and aging, and Scott (2001) points out that the 'self-service model' of electronic banking and automated phone services cannot be expected to suit all users, particularly older ones. For those older people with visual or motor disabilities, the absence of interfaces and services that allow for these disabilities is a very significant barrier (Human Rights and Equal Opportunity Commission 2000; Mitchell 2000).

Security and privacy are also important considerations. Lloyd (2001) notes that older people are very concerned about these issues, particularly regarding credit card transactions. A similar response came from discussions with the Focus Group (Council on the Ageing 2000a).

One way these barriers are being addressed is in the growth of seniors computer clubs. Describing her experiences in organising these clubs, Bosler (2001) notes that when many older people arrive at a club they confess that a son or daughter has just bought a new computer and given them the older one, but add that they were very busy and had no time to teach them to use it. Another reason that people join these clubs is that they have had some workplace experience with computers but want to learn to use a computer for their own purposes. When questioned on why they use computers answers included: booking a holiday, buying/selling shares, genealogy, information on cancer drugs, paying bills and using e-mail (Bosler 2001). Many people wanted to be able to keep in touch with family and friends while others wanted to shop or research. Bosler tells of one older woman who bought a computer, with e-mail access, specifically so she could write her memoirs.

## **RESEARCHING THE ADOPTION OF ELECTRONIC COMMERCE BY OLDER PEOPLE**

Many older people are quite innovative and entrepreneurial, and are prepared to consider the advantages offered by using e-commerce. Conversely, others are happy to continue to do things in the same way they always have and see no need to investigate use of this technology. How and why people differ in this way, and why some adopt some technologies and not others will be considered now. Rogers (1995 :11) defines an innovation as "... an idea, practice, or object that is perceived as new by an individual ...". We will thus argue that the adoption of e-commerce by an older person should be seen as an innovation and so considered through the lens of innovation theory. The most widely accepted theory of how technological innovation takes place is provided by innovation diffusion (Rogers 1995), but most of the research based on this model involves studies of large organisations or societal groups. This paper argues that another approach, that of innovation translation, has more to offer in considering the adoption of e-commerce by older people.

The innovation translation approach draws on the sociology of translations, more commonly known as actor-network theory (ANT). The core of this approach is translation (Law 1992), which can be defined as: "... the means by which one entity gives a role to others." (Singleton and Michael 1993 :229). In considering how the adoption of e-commerce by older people occurs it is necessary to examine their interactions with a number of other people. It is also important not to ignore the influence of the many non-human artefacts that are involved including computers, modems, Web browsers, Internet service providers, e-mail documents and Web pages. In trying to understand this adoption it may be useful to see these interactions in terms of negotiations, not just between humans but also involving non-humans.



Actor-network theory (Callon 1986; Law 1992; Latour 1996) attempts impartiality between all actors, whether human or non-human, and makes no distinction in approach between the social, the natural and the technological. Using an actor-network approach all the factors (both human and non-human) influencing eCommerce adoption are seen as actors, and the combination of all of these in terms of networks. It is a feature of actor-network theory that the extent of a network is determined by actors that are able to make their presence *individually felt* (Law 1987) by other actors.

Research in technological innovation is often approached by focusing on the technical aspects of an innovation and treating 'the social' as the context in which its adoption takes place: assuming that outcomes of technological change can be attributed to the 'technological' rather than the 'social' (Grint and Woolgar 1997). At the other extreme social determinism holds that more or less stable social categories can be used to explain change, and concentrates on investigation of social interactions, relegating the technology to context; to something that can be bundled up and forgotten. This bundling means that fixed and unproblematic properties or 'essences' can be assigned to the technology and used in explaining change (Tatnall and Gilding 1999). Rather than recognising in advance the essences of humans and of social organisations and distinguishing their actions from the inanimate behaviour of technological and natural objects, ANT adopts an anti-essentialist position in which it rejects there being some difference in essence between humans and non-humans. ANT considers both social and technical determinism to be flawed and proposes instead a socio-technical account (Latour 1986) in which neither social nor technical positions are privileged.

## INNOVATION TRANSLATION AND ACTOR-NETWORKS

Latour (1996) maintains that in an innovation translation model the movement of an innovation is in the hands of people whom may react to it in different ways. They may accept it, modify it, deflect it, betray it, add to it, appropriate it, or let it drop, and each shapes the innovation to their own ends. Instead of a process of transmission we have a process of continuous transformation (Latour 1996) where getting an innovation accepted calls for strategies aimed at the enrolment of others.

Grint and Woolgar (1997) note that an actor-network is configured by the enrolment of both human and non-human allies, and that this is done by means of a series of negotiations in a process of re-definition (Callon 1986) where one set of actors seeks to impose definitions and roles on others. Callon (1986) outlines four stages in the process of translation, the first of which he calls *problematization*. In this stage a group of one or more key actors attempts to define the nature of the problem and the roles of other actors so that these key actors are seen as having the answer, and being indispensable to the solution of the problem. In other words, the problem is re-defined (translated) in terms of solutions offered by these actors (Bloomfield and Best 1992).

The second stage, which Callon calls *interessement*, is a series of processes that attempt to impose the identities and roles defined in the problematisation on the other actors. It means interesting and attracting an entity by coming between it and some other entity (Law 1986). If the *interessement* is successful the third stage, *enrolment*, will follow through a process of coercion, seduction, or consent (Grint and Woolgar 1997) in which one set of actors imposes their will on others and these others yield to the persuasion (Singleton and Michael 1993). All going well, this will then lead to the establishment of a stable network of alliances. Finally *mobilisation* occurs as the proposed solution gains wider acceptance and an even larger network of absent entities is created (Grint and Woolgar 1997) through some actors acting as spokespersons for others.

## INNOVATION TRANSLATION AND OLDER PEOPLE'S ADOPTION OF E-COMMERCE

One reason often given by older people (Gross 1998; Bosler 2001) for adopting Internet technologies is, quite simply, so that the world does not pass them by and so that they won't be left out of things. The means of social interaction is increasingly moving away from posted letters to e-mail, and those not using e-mail are finding it harder to keep in touch. Many older people are finding that an e-mail address is becoming essential (Perry 2000).

Many older people consider that being able to keep in touch and converse sensibly with their grandchildren is very important (Alexander 2000). As this requires that they spend some time coming to grips with technology (Philbeck 1997) they make adoption decisions for this reason. In the same vein, being able to understand what is meant by a .com, and why some people see the continuing growth of Microsoft as a threat, means that they need to engage with the technology (Perry 2000).

These, and related reasons for adoption of Internet technologies such as "All my friends use e-mail and I'll be left out if I don't" (Council on the Ageing 2000a) suggest that characteristics of the technology have less to do with things than do social interactions and the creation and maintenance of networks. Innovation translation offers a way of researching just this as networks of human and non-human actors is its staple. For older people the issue of whether or not to adopt Internet technologies has been problematised (Callon 1986), not as one to relate to characteristics of the technology, but as one of communication and keeping in touch with family and friends. (The growth of seniors computer clubs is another example of this.) The Internet, that is capable of so much, has been translated here to include just the means by which these people can maintain their place in society and keep relevant to their family and friends. What they have adopted is not the Internet as a business might know it, but a translation resulting in technology that offers a means of maintaining contact with the world.

It is well known that the major banks are presently attempting to change the problematisation of banking from an activity carried out in person in suburban branches to one undertaken using ATMs and the Internet. Put another way, the banks are attempting to translate banking from a social activity to an electronic activity. It is also clear that many older people are resisting this change as is demonstrated by their reluctance as a group to adopt electronic banking.

As an example of how innovation translation can provide explanatory power to the investigation of how older people adopt technology, consider the case of a Melbourne grandmother with family in London and Rome considering the adoption of e-mail as a means of keeping in touch with them. Let us assume that, like many older people, she had previously relied on posting airmail letters as she found the cost of phone calls too high, and also preferred writing to speaking on the phone. Electronic mail offers a problematisation of letter writing where the 'letters' can be short, informal, and sent as frequently as required for low cost, in contrast to the longer, more formal style of airmail letters. This offered her a *translation* of Internet use to become just a means of writing letters as often as she wants, that will be 'delivered' very quickly and for low cost (once the computer system has been set up). It may be that she saw no point in 'browsing' or 'surfing the Internet' and would not adopt Internet use for these reasons. The translation of Internet use to ignore all these features and concentrate just on letter writing is what is being instrumental in convincing her to consider its adoption. All the other characteristics of the Internet are irrelevant to her. Without this translation the Internet may have been too intimidating; now it was something she could understand and handle. Interestment is then provided by the informality, lower cost and quicker delivery time of the e-mail, in comparison to ordinary letters. This comes between her and her use of ordinary mail and makes e-mail seem more attractive. The result is enrolment, as she sees and becomes convinced of the benefits of e-mail and then adopts this technology. She may then mobilise the technology by attempting to get other friends in Perth or New York to whom she currently also sends letters, to also adopt e-mail so that she can more easily communicate with them also.

## CONCLUSION

Although some older people find the self-service model of e-Commerce threatening, for others it represents independence and equality (Scott 2001). We would argue that which of these groups older people find themselves in has more to do with social factors and their network of interactions than with any characteristics of the technology itself. Innovation diffusion concentrates more on the technology, while innovation translation looks at the formation of networks of human and non-human actors and how these interact. Translation looks more at the uses people might make of the innovation, and how the innovation needs to be 'translated' for these uses to be achieved. It offers a means by which any number of small subtle factors can be addressed in each instance of adoption, rather than just looking for large scale answers across the board. While diffusion theory may be useful in describing the worldwide movement to adopt Internet technologies, translation theory offers a better means of looking at the detail of individual adoptions.

We thus contend that an innovation translation approach offers a useful way of investigating the *detail* of how and why older people adopt, or fail to adopt Internet technologies and electronic commerce. We argue that bringing out this detail is especially important in any understanding of how this complex process occurs.

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# Wireless Computing, Privacy and Security

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## ABSTRACT

*Increasing demand for wireless devices such as wireless phones has seen the potential of accessing emails in a wireless manner. These wireless devices, in conjunction with Wireless Application Protocols (WAP) have enabled laptops to communicate and transfer data between data networks along with voice networks. However, in recent months, media clipping have emerged in the area of privacy concerns associated with wireless device and this in turn has raised alarms in the security domain. The combination of privacy and associated security issues creates a unique influence on wireless computing environment. This paper provides a discussion on how this combination affects wireless users specifically on three important aspects of privacy – anonymity, fairness and control over personal information and confidentiality.*

*Keywords: Wireless Computing, Security, and Privacy*

## INTRODUCTION

Recent innovations in wireless computing and associated technology including e-mail and access to the Internet have raised a number of privacy issues (Smith & Andrews, 2001). Wireless applications, because of its decentralised, open, and interactive nature, are perhaps the first electronic medium to allow every user to engage in electronic commerce. Users can reach and create communities using ad hoc networks facilitated by wireless technology and this enables the technology to be used for delivering services, from education and healthcare to public information. This, combined with the World Wide Web, will enable users to access voice, data, and video, in order to establish a virtual "face-to-face" social and political milieu.

However, it remains an open question whether the wireless applications' claimed potential would be achieved (Craig & Julta, 2001). This is because of the worry about wireless' threat to the traditional authority of governments and organisations. The private sector sees the economic potential of the Internet, but anti-competitive impulses are also part of the landscape. Users bring not only their social aspirations to the Internet, but also their potential for antisocial behaviour.

Protection of privacy is one of the critical issues that must be resolved and is being addressed in various quarters (Stowe, 2000). Will the wireless medium be one in which individuals maintain, lose, or gain control over information about themselves? Will it be possible to preserve a protected sphere from unreasonable government and private sector intrusion?

But it is not just individuals' self-interest leading governments and lawmakers towards increased privacy protection. Faced with numerous surveys documenting that the lack of privacy protections is a major barrier to consumer participation in electronic commerce, businesses are beginning to take privacy protection more seriously (Young, 2000). Numerous efforts at self-regulation have emerged; both cooperative, such as TRUSTe, the Better Business Bureau's Online Privacy Program, and the Online Privacy Alliance; and perhaps more importantly for the long run, company specific. A growing number of companies, under public and regulatory scrutiny, have begun incorporating privacy into their management process and actually marketing their "privacy sensitivity" to the public. The collective efforts pose difficult questions about how to ensure the adoption and enforcement of rules in this global, decentralized medium.

Governments are also struggling to identify their appropriate role in this new environment (Hulme, 2000). To date, government policy appears to be largely based on the principle 'first do no harm.' The dialogue in recent months, evidenced by developments such as the recently passed Privacy Protection Act in the domain of children using online schemes, which was supported by children's advocates, privacy advocates, and companies has taken an important turn. These developments provide tangible evidence that common ground is within reach.

The following three issues – expectation of anonymity, control over personal information and expectation of confidentiality – will detail how privacy of an individual can be affected in a wireless medium, privacy regulations that have been put in place to safeguard individual privacy and potential security threat.

## **ANONYMITY**

There is a general expectation from individuals that their anonymity will be protected when they communicate over the Internet, irrespective of their method of connectivity. If an individual has not actively disclosed information about himself or herself, then the expectation is that no one knows about the individual's identity. However, due to the possibilities of generation of an elaborate trail of data in the Internet arena, it is not always possible for an individual to assume that the anonymity is guaranteed. The individual's profile can be captured via transactional data, click stream data, or 'mouse-droppings' and this reveal an individual's online life.

For example, in the connected medium, technologies such as "cookies," enable Web sites to surreptitiously collect information about one's online activities and store it for future use. In a wireless environment, these cookies can be replaced with locator devices such as "Cell-Loc". These locator devices are capable of identifying the location of a wireless device such as mobile telephones and hence its user. It appears that these locator devices are so powerful and accurate that it is possible to identify a device with a precision of 15 metres from its location. Initially, designed for the benign purpose of enabling employers to recognize an end users for responses, these locator devices are posing threat to one's anonymity and hence privacy. In a wireless environment, these locator devices facilitate the tracking and monitoring of specific individual's activities. The surreptitious collection of information about individual's activities, across multiple locations enabled through some locator device implementations, gained the attention of marketing professionals to target end users for online advertising.

This has resulted in a battle being waged today, over the "location" information available through many cellular networks, foreshadowing the larger privacy considerations lurking in the vast data generated by individuals' use of wireless devices (Deise, Nowikow, King, & Wright, 2000). In the course of processing calls, many wireless communications systems collect information about the cell site and location of the person making or receiving a call. Location information may be captured when the mobile device is merely on, even if it is not handling a call. While the government seeks to build added surveillance features into the network and ensure their access to the increasingly detailed data it captures, the private sector is considering how to use this new form of information.

It was reported on 7 May 2001 in 'The Australian' that privacy laws require that companies get the consent of users before text ad messages are sent to mobile phones. It appears that this regulation will be in operation from December 2001. According to the national newspaper there are two major implications: firstly, companies who do not comply to this regulation will be asked to do so by the national privacy commissioner to change their policies; secondly, in more serious cases, where divulging personal details resulted in the loss of a job or discrimination, consumers could claim restitution in the civil courts. Therefore, employers would have to safeguard, update and hand over personal information such as an individual's resume and work history, including opinions about their ability, if requested by an employee. The aim of this regulation was for consumers to control their personal information and how it was used by private companies. It also appears that consent would be the key to determine whether a breach has occurred or not.

In terms of security, there can be two problems: firstly, the security guaranteed by the technology and the information security (Anonymous, 2000a). Some wireless applications guarantee minimum level of security at their architecture level and leave high level security such as encryption to occur at application level. In a radio frequency operated wireless, due to the inherent nature of radio frequencies, it is possible for an outsider to 'eavesdrop' easily and this can cause security problems. In terms of data security, it is possible for hackers to identify addresses and steal data that are in transmission with out the sender and receiver being notified. Further, as mentioned earlier there are software packages available to inform the location of a user and this may lead to potential physical security problems.



Issues concerning security of data appear to be assuming importance in the wireless computing environment due to the use of radio frequencies. In the radio frequency based wireless computing environment, it is possible to eavesdrop with minimum difficulty. Therefore, the design of wireless devices needs to ensure high levels of data security. This has an impact for consumers. The current weakness in security has triggered concerns about unauthorised access to consumers' data and voice messages. In essence, the current growth of wireless computing is marred by the two major data security concerns: identification integrity, and message integrity.

Identification integrity refers to the signature elements found in messages in order to provide the origin of the message. The message integrity refers to establishing that the message is received as sent and no third party has attempted to open, modify or alter the contents. These two items appear to cause concern to both sender and receiver. The sender risks theft or misuse of their personnel information such as account and bank details and the receiver (usually a merchant) risks repudiation of the transaction and resultant non-payment.

In addition to the above, the growth of wireless computing depends upon consumer acceptance of the overall technologies. The technology is such that the services offered will eventually warrant payment. There will be no "free services" in the future. It is envisaged that the payment for services will be through some form of "credit card". The details of credit cards will probably be stored in a smart card used for devices such as mobile telephones. This has inherent risks. When the credit card information is sent through a network (wired in e-commerce and wireless in m-commerce), the network must be able to guarantee its security. A breach of security can happen if the network is not secured. From the consumers' viewpoint, personal details can be exposed when using digital cash. In addition, certain countries can demand that banks provide customer details, such as their expenditure, for tax related purposes. This would also expose certain consumers.

## **FAIRNESS AND CONTROL OVER PERSONAL INFORMATION**

When individuals provide information during a transaction, for example to a doctor, they expect that the information collected will be used for the sole purpose of providing the service requested. Unfortunately, current practices, both offline and online, foil this expectation of privacy. Information generated in the course of a business transaction is routinely used for a variety of other purposes without the individual's knowledge or consent. There are instances where some entities go so far as to declare the information individuals provide them as company 'property'.

While it is expected that strong concern for privacy issues include sensitive information such as health and financial records, recent incidents in Australia involving the sale and disclosure of what many perceive as less sensitive information indicate a rising of privacy concerns among the public. This has resulted in consumer outcry and corporations as well as government entities have learned the hard way that consumers are prepared to protest against services that appear to infringe on their privacy.

There are number of incidents where personal information of individuals is disclosed without any proper consent (Anonymous, 2000b). For example, during August of 1997, American Online ('AOL') announced plans to disclose its subscribers' telephone numbers to business partners for telemarketing. AOL heard loud objections from subscribers and advocates opposed to this unilateral change in the 'terms of service agreement' covering the use and disclosure of personal information. In response, AOL decided not to follow through with its proposal. At the beginning of the year, the Washington Post reported that several states had entered into agreements to sell state drivers' license photos to Image data. Under public scrutiny the deal seemed quite different, state governors and legislatures quickly moved to block the contract. In Australia, there is concern over the planned sale of patient's health records collected through pharmaceutical institutions to undisclosed commercial companies (reported in the Australian, 27 February 2001).

The wireless technologies' surveillance capacity to collect, aggregate, analyse and distribute personal information coupled with current business practices have left individual privacy unprotected. While recent surveys and public pressure have raised the privacy consciousness of companies, particularly those operating online, individuals' information is frequently used and disclosed for purposes well beyond what the individual provided it for.

It appears that in Australia privacy concerns are not fully resolved. In Australia, all government agency web sites should contain a privacy statement or disclose their privacy policy by December 31, 2001. It appears that this issue has not yet been resolved. The privacy policy should detail what information a web site is going to collect, how it would be used and whether it would be disclosed to third parties, including other government agencies. While this requirement gives a feeling that the consumers are guarded, making changes to existing policies on a web page or encouraging consumers to read those policies is practically not possible. This will also not constitute 'adequate notification' as warranted in privacy legislation.

There are operational difficulties in the implementation of obtaining consent from consumers. While most web sites use the 'click' method to acquire consent, the privacy laws appear to be aiming at more than this 'click' method. Visitors to a web site might be confronted with an upfront explanation and then be required to click their consent at the end of each page of information display or at the end of each section, realising unnecessary delays every time information is provided. Further, for auditing purposes, these keystrokes need to be logged and saved.

The National Electronic Authentication Council (NEAC) also has highlighted deficiencies in the current privacy laws relating to the relationship between parties involved in Public Key Infrastructure (PKI). This issue is not yet fully addressed and only recently banking industries have accepted to follow a uniform PKIU policy.

In terms of personal information, especially in a wireless environment, the security threats can be classified into various categories such as hardware security, access security and information security. One aspect needs mention. In a legal framework, the lawful interception of data and the subscriber information is in some cases a necessity for authorized law enforcement agencies. This is usually hampered by the use of strong end-to-end encryption such as IPSec or PGP (Pretty Good Privacy). Allowing law enforcement authorities to intercept messages employing a method called Escrowed encryption leads to a centralized storage of the user's keys thus increasing the security risks.

Until recently, end-to-end security was not available for wireless devices. This is changing with the introduction of WAP 2.0, which has enabled client authentication in addition to server authentication. This progress has been made possible with industry players working together. An example of such a partnership is collaborations between Motorola and Baltimore.

Involvement of trusted third parties such as banks is a source of trust and confidence for users to conduct transactions. The industry giants such as Ericsson, Nokia, Motorola, Master Card, VISA, etc., have formed alliances to make transactions more secure. However, the lack of a single global standard for conducting transactions in the wireless commerce arena can be seen as a limiting factor.

Existing global wireless architecture is based on WAP's WTLS protocol (Schiller, 2000). While fundamental security services such as confidentiality/privacy, integrity, authentication and digital signing leading to non-repudiation have been addressed in the Australia's electronic transaction act, wireless security services for server authentication, client authentication and digital signatures haven't evolved fully, thus providing an all-encompassing security framework in which transactions could take place still a dream.

## CONFIDENTIALITY

When individuals send an e-mail message, they expect it to be read only by the intended recipient. Unfortunately, this expectation is not fully met by the existing wireless technology. If an individual is using wireless devices provided by the organisation, then it is possible, and legal, for the employer to monitor these devices, leading to non-assurance of privacy. Further, in a wireless environment, it is possible for a third party to capture the email, read, alter the contents and then transmit to the original recipient.

While domestic law provides e-mail the same legal protection as a first class letter, the technology leaves unencrypted e-mail as vulnerable as a postcard (Lee, 2000). Compared to a letter, an e-mail message travels in a relatively unpredictable and unregulated environment. In a wireless environment, due to intermediaries taking an active part in transmitting data, wireless emails can hop through a number of networks. As it travels through these networks, wireless e-mail is handled by many independent entities, whereas a letter is handled only by the postal service. To further complicate matters, the e-mail message may be routed, depending upon traffic patterns, overseas and back, even if it is a purely domestic communication. While the message may effortlessly flow from nation to nation, the statutory privacy protections stop at the border because of domestic laws and their jurisdiction. In addition, the Internet does not have central points of control and while the decentralised nature of the Internet allows it to cope with problems and failures in any given computer network, by simply routing in another direction, it also provides ample opportunities for those seeking to capture confidential communications. Policy of a single computer network can compromise the confidentiality of information. While the privacy issues discussed above are centred on e-mails, the issues are applicable to electronic diaries, medical records, any date communication, and confidential documents that are available on the network and accessed by a wireless device. This has drastic consequences for our privacy as information moves further out onto the network our existing statutory framework provide less and less protection.

It's useful to look at the weak state of privacy protections for other personal papers and records. The national laws protect these private papers. However, with the advent of home computers, individual diaries moved to the desktop and the hard drive. Further, network computing allows individuals to rent space outside their home to store personal files and personal World Wide Web pages. The information has remained the same. Storing those personal information on a remote server eliminates many of the privacy protections they were afforded in a physical world. In many countries, an individual's thoughts recorded electronically on a remote computer may be obtained from the service provider through a mere court order with no notice to the individual at all.

The weak state of privacy protection is evident in the business setting too (Lee, 2000). In the health industry, physicians are using intranets to enable the sharing of patient, clinical, financial, and administrative data. Built on Internet technologies and protocols, the private networks link the hospital's information system to other associated systems such as the pharmacy systems. In Australia, the government has access to the computer-based patient record system throughout the nation for financial assistance. Further, private sector companies are moving to integrate this data with commercial ideas.

Using wireless technologies, it is possible to move these records out of our doctor's offices for the purpose of consultation. While the use of network technology promises to bring information to the fingertips of medical providers when they need it most, privacy concerns are also raised, because the identification schemes of persons who access these information sources is not fool-proof.

In the absence of comprehensive national legislation to protect patient privacy, the legal protections afforded to individual's data may vary greatly depending upon how the network is structured, where data is stored, and how long it is kept. If records are housed on the computer of an individual service provider such as a doctor, then access to that data will be governed by national legislation. Law enforcement would be required to serve the individual service provider with a warrant and this service provider would receive notice and have the chance to halt an inappropriate search. Under national law, the consumer however, would receive no notice and have no opportunity to contest the production of the records. When information is in transit between a service provider and an organisation through a network, law enforcement's access is governed by the warrant requirements of the national electronic communications act. In this case, neither the service provider nor the consumer receives prior or contemporaneous notice. If the records are stored on a server leased from an Internet service provider, the protections are unclear. They may be accessible by mere subpoena. If they are covered by the "remote computing" provisions of national telecommunications act, this would severely undermine privacy in the digital age.

## **CONCLUSION**

Privacy has assumed importance in the Wireless domain because of certain privacy violations in the recent past. Both businesses and governments are working in tandem to identify potential breaches to individuals' privacy and new laws have been drafted and existing laws have been amended. In the wireless area, due to its infancy stage, it is still not clear how these privacy laws can be implemented in both domestic and international arena. It is hoped that the issues highlighted in this paper provide some insights into the problems to all parties involved – consumers, businesses and governments.

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# Stakeholder Coordination Among Distributed Public Sector Agencies in a Nationwide Data Integration Initiative

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## ABSTRACT

*The integration of information systems across multiple public sector agencies enables a sharing and aggregation of data that can lead to more effective public administration. While there are many technical barriers to inter-agency data sharing, interoperability between agency systems can be constrained by factors in the social and political environment. This research in progress explores the how different stakeholders influence inter-agency data sharing initiatives. The investigation uses techniques in mapping stakeholder networks to interpret how stakeholders shape the development of a nationwide data integration initiative.*

*Keywords: Electronic Government; Data Integration; Stakeholder Analysis, Social Network Analysis*

## INTRODUCTION

Implicit in many of the proposed e-government reforms and initiatives is the assumption that existing data and systems can be seamlessly integrated with new technologies and business processes. With advances in enabling technologies such as XML, agent-based systems, data-mining, ERP systems and the growth in the expertise available for their use, the visions of e-government are technically feasible. While the technical barriers to e-government continue to fall, research in the public sector domain indicates that the processes through which information systems initiatives are implemented in public sector organisations are subject to a wider array of environmental forces than are encountered in private sector organizations (Bozeman & Bretschneider 1986, West, 1998, Thong et al. 2000). Consequently, for the successful implementation of e-government initiatives, these environmental factors need to be managed throughout the rollout.

There are many benefits to be gained from sharing data between public sector agencies. When conducted within privacy and other parameters, the access to aggregated data can lead to improved service and policy formulation (Landsbergen & Wolken 2001). However, as reform of the public sector continues and a greater emphasis is placed on service delivery and performance, the social environment in which interoperable systems are developed is becoming more complex. The public sector is increasingly making use of partnering relationships with external service providers. Inter-agency rivalries and political imperatives add to the richness of the context in which systems are integrated. Therefore, for information systems integration projects that span several agencies, there can be multiple stakeholder groups trying to exert their influence. This research in progress explores how different stakeholders influence the integration of data and systems between multiple public sector agencies. The analyses will be used to derive recommendations for managing the complex relationships that arise in e-government systems integration.

## RESEARCH METHODOLOGY

In the preliminary phases of this research it is proposed that an interpretive analysis of stakeholder interests and influence can be facilitated by making use of techniques for mapping and analyzing stakeholder networks. One approach to understanding the complex environment of e-government initiatives is through an examination of the social networks that develop through system construction. Formal and informal management structures are set in place and specific activities are performed in relation to system development. These structures and activities are means through which the interests of stakeholder groups can become inscribed in the project.

The interpretive study focuses on the activities of social networks surrounding the development of a national system for motor vehicle and driver licensing in Australia. The development of the national system requires the integration of several existing systems across state jurisdictions. This study investigates the networks of stakeholders who have influenced the interoperability of the many existing systems that need to be integrated for nation-wide implementation.

Two principal techniques will be used in the analysis. Firstly, following the principles outlined by Pouloudi & Whitley (1997), stakeholders will be iteratively identified and critical actors related to one another according to their role(s) and the context of their activities in relation to the data integration initiative. Secondly, using techniques drawn from Social Network Analysis (Scott, 1991), relationships between stakeholders involved in the project will be mapped and analysed to facilitate interpretation of how these social networks influence system construction.

Social Network Analysis (SNA) is widely used in the social and behavioural sciences to map and analyse the structure of social networks. The social network analysis focuses on relationships among social entities and has been variously applied at different levels of analysis, for example; communications among members of a group, transactions between corporations, and treaties among nations (Burt & Minor, 1983; Wellman and Berkowitz 1988; Wasserman & Faust, 1994). In relation to information systems, social network analysis techniques have been applied in the study of innovation diffusion, as well as, IS implementation (Graham, 1998; Hislop, Newell et al, 1998).

In social network analysis, attention is paid to the ties, contacts and meetings between agents that connect them in the larger relational systems (Scott 1991). For instance involvement in activities of design decisions, project management and budgeting, as well as system use, all contribute to system construction. By associating actors with these activities, ties between actors are identified. Matrix algebra techniques can then provide an empirical basis for analysis of the structure of the networks of actors involved and their interactions.

Preliminary data for this case study has been accessed through a wide-ranging analysis of relevant documents including requirements specifications, contract tender documents, the system information strategy and steering committee meeting minutes. Interviews with key stakeholders have been conducted to clarify issues. It is proposed that the full exploration and analysis of this case will involve management, IT developers and users from several agencies and private sector contractors.

## THE NATIONAL REGISTRATION AND LICENSING SYSTEM (NRLS)

Motor vehicle registration and driver licensing are the responsibility of agencies in each state and territory in Australia. Although there is a high degree of similarity between the information systems that each jurisdiction has developed to support registration & licensing, the laws, policies, business rules and conditions peculiar to each jurisdiction have resulted in disparate systems that address local rather than national needs.

The potential administrative and commercial benefits to licensing organizations, as well as to several private and public sector agencies (eg police and motor vehicle dealers) that the integration of jurisdictional systems could have, has long been recognised. In 1993, the national association of road transport and traffic authorities (AUSTROADS) commissioned a study proposing a system that would integrate registration and licensing systems on a national basis. The aim of this system was to allow inter-jurisdictional access to information regarding among other things, driver licensing; vehicle registration; written-off vehicles, stolen vehicles, and accreditation for heavy vehicles on a national basis.

In 1998 AUSTROADS entered into a build and operate contract with a large IT service provider. This arrangement has essentially allowed NRLS to be built with no capital outlay. The contractor recovers its outlay, costs and return through a combination of subscription and transaction charges.

NRLS is primarily a custodian of jurisdictional data rather than the "owner" of the data. Therefore, local arrangements still define how and by whom the data is accessed. NRLS communicates with each jurisdictional system through a proprietary messaging protocol. To obtain the greatest benefit from the NRLS development, each jurisdiction needed to make significant modifications to their core registration and licensing systems so that NRLS remained transparent to users. The technical architecture for NRLS is shown in figure 1.

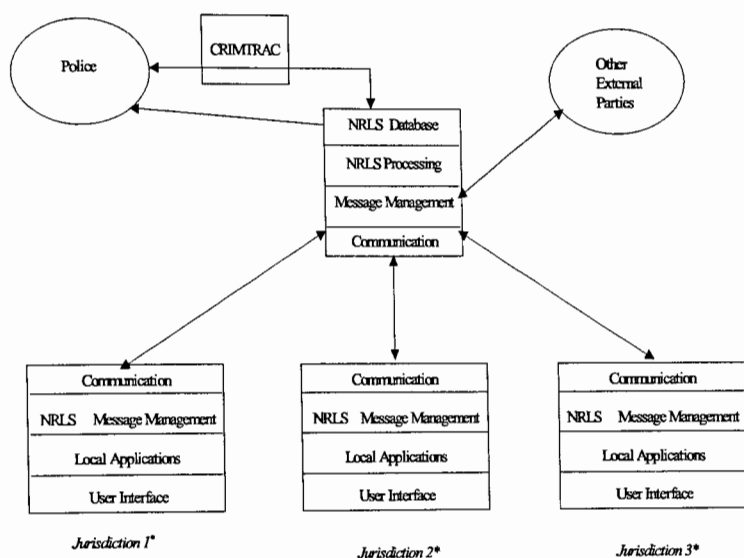


Figure 1.

\*There are eight jurisdictions  
Access to Newdis is transparent to the user

### NRLS Technical Architecture

Given that NRLS required the cooperation of several jurisdictions, external users and private sector contractors, a management and accountability structure was set in place to enable the representation of the interests of multiple stakeholders. The stakeholders in the management and accountability structure for NRLS are described in Table 1.

Stakeholder	Role
AUSTROADS Council	Ultimately accountable for all activities and approves major resource, cost or policy questions which affect NRLS.
AUSTROADS Registration and Licensing Reference Group	Comprises senior executives in each jurisdiction managing Registration and Licensing; responsible for Policy Strategy and Business Level guidance and sponsoring significant decisions concerning NRLS to the AUSTROADS Council.



AUSTROADS Program Manager, Road Use Management	Individual representing the Council and the Reference Group in day-to-day management questions; delegated authority for financial and other resource decisions.
NRLS Steering Committee	Represents all significant users of NRLS and provides detailed guidance on functionality, priorities etc. Its constitution and frequency of meeting will vary through different life cycle stages of NRLS. Forwards significant policy and resource matters to the Reference Group for decision.

**Table 1: NRLS Management and Accountability Structure**

In addition to the management and accountability structure, the awarding of the NRLS contract to a private vendor required the establishment of a new administrative group having direct responsibility for the operational activities involved in coordinating the NRLS project. After considering several options, the NRLS steering committee chose a model in which an administrative group of staff were drawn from the jurisdiction closest to the contracted NRLS operator's site and located in that jurisdiction's offices. This administrative group therefore had expertise in registration and licensing functions and experience in liaising with other jurisdictions. Subsequently, the NRLS administration unit has been hosted within the Traffic Authority of Jurisdiction A, with the manager responsible to a reference group comprising the most senior Registration and Licensing executive in each jurisdiction. The cost of the salaries of this group is being met by contributions from the NRLS partners.

### **PRELIMINARY ANALYSIS**

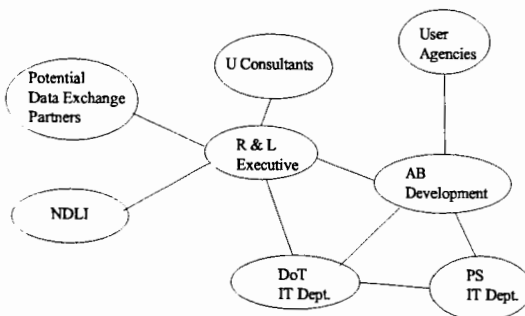
A full analysis of the social networks and their influence on the construction of the NRLS system is beyond the scope of this paper. However, using the techniques discussed above, it is possible to commence untangling the networks of associations between stakeholders and begin to trace the influence that they can have on system integration.

Table 1 describes the bureaucratic relationships between stakeholders from several agencies. However, the identification of stakeholder groups in the management structure for the initiatives does not capture the complexity of stakeholder relationships or the dynamics of their interactions. For example, although each jurisdiction is represented on the NRLS steering committee, members of this management network are linked to several other networks of developers and users who can potentially influence the construction of the system. Following the principles of stakeholder analysis suggested by Pouloudi and Whitley (1997), table 2 begins to expand and refine the identification of stakeholders in the NRLS system along the dimensions of users, management and developers.

Stakeholder Group	Stakeholder Representative
Management	Executives from J1-J7 NRLS program manager
Developers	Developer Team J1-J7 Developer Crimtrac NRLS Contractor External user IT contractor
Users	User Group J1-J7 External Agency Users

**Table 2: Stakeholders in NRLS Development (1<sup>st</sup> Iteration)**

This initial analysis identifies “obvious” stakeholders and indicates networks of actors who interact with each other along mainly jurisdictional lines. Further iterations will elaborate the make up of jurisdictional networks. For example, considering the development team of a single jurisdiction (J2), the stakeholder network for the development of NRLS is extended even further as it includes private contractors and other agencies who have an interest in the design of the jurisdictional system with which NRLS exchanges data (figure 1).



**Figure 1: NRLS Development Stakeholder Network (Jurisdiction 2)**

The network depicted in figure 1 relates to only one of several systems that exchange data with NRLS. Therefore when examining how the stakeholder networks of can influence the construction of NRLS, complex relationships among and between several networks must be considered. For example, the original design of NRLS was based around a proprietary protocol and is subsequently used in interfaces with all jurisdictions. The initial choice of this protocol was determined and supported by the contracted vendor. With the forthcoming expiry of the contract to operate NRLS, alliances have begun to form among jurisdictions along two lines. The first alliance supports the proprietary system. The second however, is seeking to ensure that future developments of NRLS are based on XML and open systems architecture.

Further investigation of these alliance network using social network analysis techniques can facilitate understanding of the central actors and how their relationships influence system design. In the NRLS case, individual actors representing stakeholder groups will be identified and associated with critical decisions regarding the design, construction and administration of the system. Both formal and informal networks of association will be mapped. It is proposed that by evaluating and comparing the structure of these networks using measures such as network density and actor centrality, reasons for the success (or failure) of aligned stakeholders in pursuing their interests can be identified.

## CONCLUSION

In many cases the visions of e-government rely on the successful integration of systems across multiple agencies. A wide range of stakeholders may become involved in these developments and attempt to influence them. While investments in inter-agency system integration are increasing with the growing enthusiasm for e-government, little research has been conducted which addresses the dynamic relations between multiple stakeholders who have interests in the construction of inter-agency systems. This research in progress investigates how networks of alliances form to constrain or enable the integration of multiple systems. The preliminary analysis of the NRLS case provides positive indications that techniques used for analyzing stakeholder networks can facilitate untangling the webs of influence.

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# 'Free' Protection for the Owners of Original Computer Programs – Is It Worth Anything?

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## ABSTRACT

*The owner of a computer program is given 'for free' the protection of the copyright laws. The purpose of this paper is to examine, in overview, the extent of the protection in light of some recent legislative amendments. This paper will then suggest protective strategies that should be adopted by computer program owners.*

## INTRODUCTION

The owners of original computer programs are protected by the Copyright Act (the Act)<sup>1</sup>. The Australian Parliament has, in recent times, extended in a number of ways, copyright protection into the digital environment and, for the purposes of this paper, into the world of the computer program. Whilst one is perhaps reluctantly forced to accept that infringement of copyright through pirating or illegal copying, frequently coupled with commercial distribution, is inevitable and will continue, nevertheless greater efforts are being taken, both in the government and the private sectors, to clamp down on and take appropriate action (being either civil or criminal or both) especially against commercially motivated pirates. The purpose of this paper is to examine, in overview, the extent and value of the protection in light of some recent legislative amendments. This paper will then suggest protective strategies that should be adopted by computer program owners.

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<sup>1</sup> Any reference to 'the Act' in this paper refers to the Copyright Act 1968 (Commonwealth) as amended.

## THE NATURE OF COPYRIGHT PROTECTION

Without wanting to get into the finer detail, copyright protection is provided by the Act to original literary, dramatic, artistic and musical works together with sound recordings, films, television and radio broadcasts and published editions.

Where then does a computer program fit? The definition of a 'literary' includes a computer program and the definition of the words 'computer program' have recently been amended to mean 'a set of statements or instructions to be used directly or indirectly in a computer in order to bring about a certain result'. The expressed aim of the new definition was that it be comprehensive but not unduly restrictive of future programming language developments. It is worth noting, at this point, that already the new definition of the words 'computer program' has been the subject of some criticism as being too limiting and suggestions have been made that the definition, in its current form, may not (despite the expressed aims) extend to cover all programmable machines nor all machines that are capable of performing particular functions. Notwithstanding any shortcomings, the bottom line is that the statements or instructions usually represented by the code of the computer program are protected by the Act as if they were literary works.

Given that the owner of a computer program is protected by the law of copyright, what then is the nature or scope of that protection? The fundamental principle of copyright law is that the author, the creator or the maker (whatever the case may be) has the exclusive right to exploit his or her original work. In the context of a computer program, it is an infringement of copyright if a person, not being the owner and without the consent or authority of the owner, reproduces in a material form or publishes or adapts or communicates the work to the public (whether within or outside Australia) in full or substantial part (or authorizes another so to do) an original literary work. Within the previous statement, there are a number of key words that, in the context of this paper, need further brief explanation.

The first key word is 'reproduce'. The word 'reproduce' is a word of wide meaning and it clearly covers the unauthorized copying of a computer program. Even if the copy is not an exact or identical copy of the original there would still be a reproduction if the two programs have a recognizable objective similarity. Further, the Act now provides that a computer program will be deemed to have been reproduced if a person, without the authority of the copyright owner, creates an object code version of a computer program that is derived from the source code by a process of compilation and equally the same principle applies if a source code version of a computer program is derived from the object code by a process of decompilation. We will return to the word 'reproduce' in the context of a discussion of reverse engineering later in this paper.

The second key words are 'material form'. The Act makes it clear that any form of storage (visible or not) from which the work can be reproduced will be in 'material form'. It is now generally accepted that electronic and magnetic storage are in material form.

The third key words are 'substantial part'. If a person copies, in full, the code of a computer program then obviously there will have been a full reproduction. But what if the reproduction consists of the copying of part only of the code. It now seems clear that the question of what is substantial is not just a question of the quantity of copying (and, of course, that remains an important consideration) but also a question of original relevance, quality, importance and essence. We will return to the key difference that exists between originality and functionality later in this paper. To illustrate what the word 'substantial' can mean, it is worth noting the decision of the High Court of Australia in *Autodesk v Dyason* (1992) where infringement of copyright was found to exist when only 127 bits from a large software package (Auto Cad) was copied. The basis of the decision was that the reproduction was substantial because the bits taken (albeit that they only represented a tiny percentage of the total size of the program) were seen as being an essential part of the program.

The final key word is 'original'. Original does not mean inventive and the standard for originality is relatively low. For computer programs, generally speaking, originality will not pose any problem. One area of concern however relates to programs that essentially are compilations (the gathering together of) publicly available information. The fact that the creator of the program may have expended time, effort, some skill and money to create the compilation will not generally give to the program the required element of 'originality'. The concept has come to be known as 'sweat of the brow' and that means that just hard work does not, of itself, create originality (Feist Publications Case, 1991). To gain the protection of copyright law through originality, the creator of the computer program would need to bring to the compilation some analysis or quality that the basic material did not possess. In every case, the program will have to be judged on its merits and it will, of course, be often difficult to determine whether the computer program (made up of the compilation) has or has not the required degree of originality. If it does then it will be protected as an original literary work by copyright law. If it does not, then no copyright protection will be afforded.

## **INDIRECT AND DIRECT INFRINGEMENT**

Infringement of copyright in a computer program in Australia can take two forms – direct and indirect.

Direct infringement occurs when there has been a reproduction made without the consent or authority of the copyright owner. With direct infringement, the fact that the person who infringes did so innocently or without intent or without knowledge is irrelevant.

Indirect infringement essentially occurs when an infringing copy of a computer program is imported by a person into Australia for commercial or trade purposes or sold or otherwise dealt with by way of trade without the permission of the Australian copyright owner. To establish indirect infringement, actual or constructive knowledge by the infringer is required. By constructive knowledge what is meant is that the person who acted without the authority of the copyright owner had no reasonable grounds to know that his or her actions were infringing. If someone is dealing in pirated illegal computer programs with the required state of mind then obviously an infringement will be found. However, when we talk of importation, brief mention must be made of the very troublesome issue of parallel importation.

## **PARALLEL IMPORTATION**

What is parallel importation? Parallel importation is the importation into Australia (for commercial or trade purposes) of a computer program in circumstances where the importer knew or ought to have known that the making of the article would, if the article had been made in Australia by the importer, have constituted an infringement of copyright. What does this all mean? With parallel importation we are talking of the commercial importation (albeit without the consent of the Australian copyright owner) of copies of computer programs that have been lawfully made outside of Australia. You may well ask – how can a computer program be made lawfully outside Australia if it is made without the consent of the Australian copyright owner? The answer to this question lies in the fact that the rights to copyright are territorially based and for the one computer program you could have one person who owns the rights in say Hong Kong, a second person who owns the rights in say Singapore, a third person who owns the rights in Australia and so on. The rights to copyright are divisible.

Given the above, the issue becomes whether an Australian copyright owner can prevent the importation into Australia of legitimate computer programs (it must not be forgotten that we are not talking here about pirated programs). As things currently stand, the answer to the question is yes because parallel importation is generally not permitted. In this context two points are worthy of mention. First, in the last few years the Australian government has introduced provisions which allow for the parallel importation of books (subject to certain conditions being met) and music CDs. Second, the Australian government announced in June 2000 that it intended to pass laws that would allow (as

early as 2002) the parallel importation of computer programs and books and magazines (without conditions). If we consider the effect of the current regime, it is possible for an Australian computer program inventor (who obviously therefor owns all copyrights in the program) to effectively control the pricing and availability of his or her computer program in the various world markets. As an example, the owner could export 10,000 copies of the program to the USA and make them available in that market at an effective price of say A\$20 yet at the same time offer them to Australian buyers at a price of say A\$100. If an importer was to buy 5,000 copies in the USA and attempt to bring them back for sale in the Australian market at say A\$50 then the importer could be prevented from so doing by the Australian copyright owner pursuant to the current parallel importation provisions. It is in light of the above example (and for other reasons) that the Australian government has announced its above stated intentions presumably with the aim of bringing greater competition and flexibility to the market place and accordingly reducing (at least in theory) the purchase price of computer programs to the Australian consumer market.

## WHAT HAPPENS TO AN INFRINGER?

Let us assume that an infringement of copyright can be established in an appropriate court by a copyright owner. The 'remedies' represent the available orders that may be granted by the court in favour of the copyright owner. Without being exhaustive, the available remedies are generally an injunction together with or accompanied by damages or an account of profit. In some cases criminal sanctions are available.

## SOME EXAMPLES

Perhaps it would be opportune at this point to consider two recent examples of actions involving the infringement of copyright in computer programs. In March 2000, an accused was fined in a NSW court for having in his possession hundreds of counterfeit copies of Play Station computer games. The case was referred to police following investigations by an accounting firm and a legal firm undertaken on behalf of Sony Computer Entertainment Australia. Sony has committed large sums of money towards its antipiracy campaign and it has been reported that they have already recovered, in civil claims, significant amounts, in damages. Press releases also claim that Sony representatives are currently investigating more than 550 alleged piracy activities within Australia, that more than 100 letters of demand have been sent and more than 40 court actions have been started. In August 2000, it was reported that Microsoft is using automated internet crawling software in an attempt to restrict the sale or online offering of its windows software. The software crawls the internet non stop searching for words such as 'warez' (illegal copies) and 'crackz' (program that enable the avoidance of copyright protection) and it further scans auction sites, download sites, newsgroups, chatrooms, classified advertisements and peer to peer networks. Once offenders are thought to be identified, test purchases, where appropriate, are made and the support of the relevant ISP is sought in an attempt to properly identify the offenders. Reports suggest that more than 7,500 illegal postings have been removed from servers in more than 30 countries and that 64 criminal and 17 civil law suits have been instituted.

We have already conceded, reluctantly, that the world will never see the end of the unfair commercial exploitation (particularly piracy) in infringing computer programs. Nevertheless steps (both practical and legal) are being taken both by copyright owners and law enforcement agencies throughout the world (and in particular the developed nations) to crack down on and reduce the extent and impact of the actions of infringers.

## **WHO 'OWNS' A COMPUTER PROGRAM?**

On many occasions already within this paper, we have made reference to the owner of the copyright in a computer program. Who then is the owner? Given that a computer program is defined as being a literary work, the starting rule is that the first owner of the copyright in a computer program will be the program's author or, if you like, its maker or creator. Whilst the answer would therefore, on the face of it, seem quite clear, problems can and do arise in the context of employment. Where a computer program is created by an author 'in pursuance of the terms of his or her employment by another person under a contract of service', the copyright in the program will, subject to an express or implied agreement to the contrary, be owned by the employer. The nature of this exception leads to 2 fundamental questions needing to be asked and answered. First, is the author an employee engaged under a contract of service and, second, if he or she is so engaged, is the computer program created in the course of his or her employment. Whilst the first question may frequently, because of the prevailing circumstances, be easy to answer in the affirmative, the second question is more problematic. You would need to consider principally what the normal duties of the employee are and within that consideration you would need to ask questions such as what is the employee's job description, where and when was the work done, were the time, services, resources and facilities of the employer used in the creation by the employee, was the creation of the computer program directed to the employees main required duties or was the work ancillary to his or her main work and so on. No one answer necessarily provides a conclusive outcome and all factors need to be considered cumulatively.

Given all the potential problems and uncertainties raised in the employment context, the easy answer would seem to lie in the employer and the employee putting their minds to and resolving this issue specifically and clearly within the terms of the contract of employment.

One other problem arises in the context of ownership. Who owns the copyright to a computer program created by an independent contractor (as opposed to an employee), at the request and at the cost of another party? In the absence of agreement, and perhaps surprisingly, copyright ownership in the computer program will reside in the independent contractor and not the person who paid for its creation. Of course, the independent contractor will grant an express or implied licence or right to the other party to use the program within his or her organization for its intended purpose. But that is not to say that the right to use extends to the ability to otherwise sell, licence, assign, copy or reproduce the program for other purposes. Again the obvious answer is for the issue of ownership of intellectual property rights to be specifically addressed in the contract of engagement which itself should preferably (from a dispute and evidentiary point of view) be in writing and be signed by the parties thereto.

## **HOW DO YOU GET 'COPYRIGHT'?**

The Australian owner of the copyright in a computer program gains protection within Australia as an automatic process. There are no formalities, no costs nor registration requirements. The Act provides protection in Australia and it is so territorially confined. It perhaps goes without saying, but in the world of computer programs, protection against infringement in Australia alone will not be adequate. The Australian owner would need the equivalent protection in major world markets. Any protection beyond Australia will depend upon Australia's entry into enforceable international agreements (conventions or treaties) between member states designed to provide enforceable reciprocal protection to the citizens of all signatory states in the area of copyright law. Clearly pursuing a 'foreign' infringer in a 'foreign' jurisdiction will, by its very nature be a very difficult, frustrating expensive and time consuming exercise and, even if the proceedings are ultimately successful, enforcement of the judgement (getting your remedies) may also often be problematic.



For the purposes of this paper, suffice it to say that Australia is signatory to a number of significant intellectual property agreements and, in the area of copyright protection, the main ones are the Berne Convention for the Protection of Literary and Artistic Works (1886), the Universal Copyright Convention (1952) and the TRIPS Agreement (1993).

## **IS THE PROTECTION REAL OR ILLUSIONARY FOR COMPUTER PROGRAMS?**

Perhaps the key weakness of copyright protection for computer programs lies in the fact that copyright law protects the expression of the idea and not the idea itself. Copyright protects the form (the way the words are written) but not the information itself.

As we have already seen, a computer program is protected by the Act as a literary work and it is the expression of the instructions or statements contained within the code that are essentially protected. The mere fact that two computer programs have similar functions or the fact that one program is compatible with another program may not, of itself, be sufficient to constitute infringement.

In recent years the Australian government has wanted to assist Australian computer program producers' competitiveness in the world market and to assist in this objective the Act was amended to specifically allow the reproduction (without the permission of the copyright owner) of a non infringing copy of a computer program in six basic categories, namely, normal use, study, back ups, the creation of interoperable products, to correct errors and for security testing respectively. In general, the rights given cannot be excluded by contract by the copyright owner but it must not be forgotten that the right to copy only applies to copies made by or on behalf of an owner of a legitimate copy of the computer program.

For the purposes of this paper we are only going to consider the exemption that allows the copying of a computer program if it is made in the course of running a copy of the program for the purpose of studying the ideas behind the program and the way in which it functions. As we have already said, the ideas behind a computer program are not protected. However, to study the ideas behind a program you would need to run the program and by so doing you are 'reproducing' the program. The effect of the exemption is that copyright is not infringed by the reproduction that happens for this purpose "in the course of running a copy of the program". Whilst the words "in the course of running" are not defined, they presumably include performing acts that you are entitled to do like loading, displaying, running or storing the program.

So what is the effect of this statutory exemption? It makes it clear that reverse engineering (as long as the codes of the program are not viewed or copied) is acceptable. Even if the statutory provision had not been enacted, such reverse engineering would have probably been allowed in any event. All that this exception does is put the matter beyond doubt.

## **REVERSE ENGINEERING**

So what then is reverse engineering in this context? It is not examining the program's internal codes (for they are, as we have seen, generally protected by copyright law as literary works) – it is looking at the behaviour of the program and the outputs that are achieved from user inputs. Having studied the function it is possible to, in effect, recreate (using your own independent and original efforts, judgement, knowledge and skills) the original computer program and its functions, through a process that is known as reverse engineering. The functions and program is compatible with and comparable to the first program (even perhaps with the same or similar commands, file structure and function keys to operate a similar operation) so that a user of the first program would have no difficulty in adopting or using the second program would not, in itself, be sufficient to constitute an infringement of copyright. Reverse engineering can also occur (sometimes legally and more often

illegally) by access to, copying of and decompilation of the program's actual code – this alternate form of reverse engineering is not canvassed any further within this paper.

There is no doubt that copyright law remains a significant and powerful area of law in the protection of computer program from infringement, but as we have just seen, it does have real limitations.

## PROTECTIVE STRATEGIES

No strategy that we can suggest can guarantee success. Infringing copying of computer programs will continue. However; we would suggest that the owner of the copyright in a computer program should consider, at a minimum, the prominent insertion in the code (and in all displays generated by the code) of a statement that not only claims copyright (© Authors Name, year) but also clearly states that extent to which copying is or is not permitted and, if it is in certain circumstances permitted, the terms and conditions upon which that copying may be undertaken. Further; in order to assist in the 'proof' requirements of any copyright infringement action, and to nullify a defence based on 'this was my original work and was not a copy', consideration should be given to the insertion in the program's code of some hidden identifiers (like watermarks or intentional but inconsequential code errors) through which unauthorized copying can more easily be identified and proved. The hidden identifiers could probably be found and removed by a competent and conscientious infringer but the practical reality is that most infringers will not take the time or trouble to either make the necessary investigations or take the necessary remedial action especially because the hidden identifiers do not affect the function or running of the program itself. Time bombs that render, after a specified trial period, a program useless unless the user enters (after payment) an appropriate diffusing code provided to the user by the owner are also worthy of consideration. It is interesting to note that some computer program owners are now creating their programs in such a way that the program will not run unless the user buys and installs some hardware and it is the difficulty of the replication of that hardware that has the effect of protecting the computer program itself. Even if the program is copied, without the hardware the program will not run.

As technology advances we will undoubtedly see more and more computer program copyright owners creating programs deliberately using technology (such as access codes, technology locks, decryption, descrambling) in ways that attempt to prevent or inhibit unauthorized copying.

As owners attempt to better protect their programs, inevitably there will be others who try to remove or avoid the measures taken. Under amendments introduced to the Act by the Digital Agenda Act, civil and criminal remedies are provided against people who make, supply, or commercially deal in or import devices that aim to circumvent technology protection measures taken by the copyright owner. A 'technological protection measure' is essentially a device or product designed (in the ordinary course of its operation) to prevent or inhibit the infringement of copyright and those words would, obviously, include a computer program. The law is directed at devices that are only significant commercially as circumvention devices and, of course, an area of difficulty will arise when one is forced to consider a device that has more than one commercial purpose. Whereas the criminal consequences require the accused to have either actual knowledge or a reckless disregard, the civil action will be established if the defendant cannot prove that he or she did not know the device would be used as a circumvention device.

## **CONCLUSION**

Computer programs that involve an inventive step may well, in addition to the protection offered by copyright law, be also protectable through the use of patent law. Whilst patent law is more certain and vigorous in its application and the enforcement of infringement, it does have problems associated with cost and registration. Discussions of the protection of computer programs by patent law are the subject of another paper.

Copyright law has been moulded to protect computer programs. Even though copyright law has real limitations, it remains a significant and powerful area of law, both in the domestic and international environments, in the protection of computer programs from unauthorized reproduction.

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# Securing e-Commerce Business Methods - What are the Choices?

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## ABSTRACT

*In the last few years there has been a move to protect, through the guise of patent law, technology that facilitates innovative ways of doing business. In this area, why has there been a shift from the sole reliance on copyright law towards securing the dual protection offered by the laws of copyright and patent? This paper considers the fundamental weakness of copyright law that has led to applications for e-commerce business method patents. Whilst this paper looks at the Australian position, the examples emanating from the United States are tending to form the basis for the future legal position in Australia.*

## INTRODUCTION

The copyright owner of an original computer program is protected for more than 50 years against unauthorized copying or reproduction of the computer program in Australia by the laws of copyright. Copyright protection is both a free and automatic process and does not require the lodgement of any records or documentation. The rights granted by law initially reside with the author of the program who may then subsequently transfer or assign them to a third party. The usual position may be changed as a consequence of the employment context. Despite its advantages, there has been a shift in recent years from the sole reliance on copyright protection to reliance upon the dual protection of both copyright law and patent law.

## THE FUNDAMENTAL WEAKNESS OF COPYRIGHT

Whilst there have been recent significant amendments made to the Copyright Act to protect technological protection measures and rights management information, the laws of copyright do not provide a complete and effective protective package. The fundamental weakness of copyright protection is to be found in the most basic concept of copyright law that protects the expression of the idea and not the idea itself.

“... it is necessary to appreciate the difference between a piece of information or an idea, and its form of expression. Copyright protection is given for the form in which an idea is clothed, but not for the information itself. This condition of copyright protection, that it exists not in the idea itself but in the concrete form in which it is expressed, leaving anyone free to use the basic idea, has been described as ‘probably the most difficult concept in the law of copyright’.” (McKeough & Stewart, 1997, p 131).

In the environment of international conventions this notion is reiterated in the TRIPS agreement at Article 9 which states:

“Copyright protection shall extend to expressions and not to ideas ....”

When one considers the above, what is it that copyright really offers protection to when one considers a computer program? It is the expression of the idea as embodied in the set of statements making up the code of the computer program – it is not the idea itself! The copyright owner has the right to prevent others, without permission, from reproducing the program and reproduction obviously covers unauthorized copying. Reproduction also covers any process which involves an object code version of the program being derived from the program in source code and (in reverse) a source code version of the program being derived from the program in object code (Copyright Act – section 21(5)). However, it is clear under Australian law that reproduction does not occur when the functionality and ideas of a computer program are copied but the code for the so called ‘copy’ has been independently written to achieve that result without translation or copying of the code in the first program. The fact that a second work performs the same functions or achieves the same result or is compatible with an original work (same or similar commands, file structure and function keys) so that users of the original work would have no difficulty in adopting the second work is not, in itself, sufficient to constitute copyright infringement.

In fact recent amendments to the Copyright Act explicitly reinforce the above notion. Until the amendments were implemented legal opinion was divided as to whether the copyright owners right of reproduction including the right to control or prohibit the temporary and immediate copying into RAM (when running the program). If that was the case then the copyright owner could, in effect, control all uses of the program and by so doing also effectively control the functionality of the program. Under the recent amendments (section 47B(3) of the Copyright Act) the rights of the copyright owner of a computer program are not infringed by the making of a reproduction of the work if “the reproduction is incidentally and automatically made as part of the technical process of running a copy of the program for the purpose of studying the idea behind the program and the way in which it functions and the running of the copy is done by, or on behalf of, the owner or licensee of the copy”.

By way of overview, the above amendment specifically allows the owner or licensee of a legitimate copy of a program (that is, one bought from or with the authority of the copyright owner as opposed to a pirated copy) to copy the program if the copy is made, firstly, as part of the ‘technical process of running the program’ and, secondly, for the purpose of ‘studying the ideas behind the program’. Whilst the word ‘running’ has not been defined it presumably allows for the legitimate copy to be loaded, stored and displayed. The process outlined above is known as ‘black box reverse engineering’ and it is allowable.

“Black box reverse engineering looks at the behaviour of the program and its documentation without resorting to examination of the program’s internal code. Different inputs into the program are observed to produce different outputs .... Using black box reverse engineering, the functionality of a program can be reproduced, with a different source code, without even obtaining access to the source code of the original program.” (Fitzgerald & Cifuentes, 2000 page 48)

## A SCENARIO TO CONSIDER

Where is the copyright owner of a computer program left? Consider the following scenario. Wally, an Australian academic creates (using his own independent skill, effort, labour, money and judgement) a computer program that solves a problem that has not been solved before. He manages, after mortgaging all his assets to the hilt, to arrange the manufacture and distribution of 20,000 disk copies of his program to 10 computer retailers around Australia. The retailers take the discs on consignment. Robin is an extremely wealthy entrepreneur who happens to buy from a retailer one of Wally’s discs. He likes what he sees. The program is inventive and ingenious. He does some checking around and then he directs his employee, Sally (who is an expert programmer) to study the ideas of the program by running it and to reproduce what the program does with different and independent coding. Sally (being an always obedient servant of Robin’s) does what she is told and within 2 days (after looking only at the behaviour of the program and without, for one moment, examining or copying the internal codes of Wally’s program) Sally has another program that performs the same basic functions as Wally’s program. Robin puts his large financial resources into manufacturing and distributing ‘his’ program worldwide. He ruthlessly undercuts Wally’s pricing structure, and within a matter of months, Wally’s operations are ‘sadly’ marginalised and he basically now has an uncommercial product. What protection rights or remedies does poor Wally have against Robin or Sally using copyright law. The answer is basically none. What should Wally have done? In short, he should have applied for a patent.

## BASIC REQUIREMENTS FOR PATENT

What then are the basic ingredients for something to be patentable? Under the Patents Act a patentable invention is an invention that is, firstly, a manner of manufacture, secondly, novel, thirdly, inventive, fourthly, useful and finally has not been the subject of secret use. As to ‘manner of manufacture’, significant court cases have indicated that these words require a product that can be produced by following the instructions in the patent specification or a process or method which can be used to achieve certain results by following the specification. The product or the process must have some industrial, commercial or trading character or application. Whilst it is beyond the scope of this paper to examine, in detail, the five requirements, this paper will consider the implications of patent law to the copyright owner of an inventive computer program.

## STRENGTHS OF PATENT

Assuming that a new ‘computer program’ is patentable (that is, it meets the necessary ingredients), the owner of the patent is given by law “the exclusive rights, during the term of the patent, to exploit the invention and to authorize another person to exploit the invention” (section 13 of the Patents Act). The term ‘exploit’ is defined to include

“(a) where the invention is a product – make, hire, sell .... use or import it, or keep it for doing any of those things; or (b) where the invention is a method or process – use the method or process or do any act mentioned in paragraph (a) in respect of a product resulting from such use” (Schedule 1 to the Patents Act).

The term of a patent is 20 years from the date of the patent.

A patent is granted only after a detailed examination (and that examination may take a period up to and beyond 2 years) is made by the Patents Office but once granted the owner has the right to prevent others from commercialising what is covered by the patent.

Given that copyright law does not protect the idea but rather the expression of the idea and given that, in reality, a patent protects the idea as embodied in a so called 'invention', it perhaps goes without saying that the owners of the copyright in inventive computer programs would be well advised to consider the appropriateness of moving towards securing a patent. Failure to do so may allow competitors to freely use the same technology albeit with a different code. If patent protection is subsequently secured, a system of dual protection will be available to the owner.

## **PATENT HISTORY FOR COMPUTER RELATED INVENTIONS**

Up until 1992 computer related inventions were regarded negatively by the Australian Patents Office for the purposes of patent applications. Computer programs were regarded largely as a method of calculation or a method of performing a mental act. Algorithms, as such, were not patentable because they were nothing but mathematical formulae. However, since 1992, whilst the form of an algorithm may not be patentable, if it enables an unanswered problem to be solved then the effect could be patentable because it produced a novel end result with commercial effect. The end result of the above is that since 1992 computer related inventions are examined on the basis of the same criteria as for any other invention.

"Doubts about the patentability of software related inventions were finally dismissed by the decision in *IBM v Commissioner of Patents* in which the Federal Court applied the reasoning of the High Court .... Following *IBM*, in 1992 the Australian Patent Office issued revised examination guidelines for dealing with computer software patent applications. The new test whether a computer related invention is directed to patentable subject matter simply asks if 'the invention claimed involves the production of some commercially useful effect'. It would be difficult to think of any e-commerce technology that does not pass this test." (Swinson & Middleton, 2000 page 72).

## **OTHER REASONS FOR PATENTING**

Apart from the two reasons already alluded to (that is, the potential weakness of copyright law and the ability to prevent competitors using the same technology) there are two other main reasons why a copyright owner of a computer program would want to secure the grant of a patent. One reason could relate to the ability to secure venture capital or financing. There is no doubt that venture capitalists and financiers see a patent as an asset or form of security and its existence will make capital raising, especially for a fledgling or start up company, easier. Another reason is to be found in the form of licensing agreements. Often a patentee may not want to prevent a competitor from entering or competing in the same market. In this regard, one only need remind oneself of the problems Apple Computer Inc got into when they tried to isolate and make exclusive their original operating system. It may be in the patentees' best interests to licence the invention to a competitor with an appropriate royalty fee to, of course, flow back to the patentee.



## WEAKNESSES OF PATENT

One would be forgiven from thinking that the grant of a patent is a panacea for the copyright owner of a computer program. There are, however, some negatives. Assuming that the program satisfies the ingredients necessary to secure a grant of patent, the gaining of that grant is a long and expensive process. Once the owner lodges the application (again assuming that the claim fairly discloses the true nature of the invention) the owner will secure a priority date ahead of other claimants but the owner will only have an infringement claim for any offending conduct after the date of publication by the Patents Office in the Australian Official Journal of Patents, Trade Marks and Designs of the invention patent specifications. The date of publication could be more than 18 months after the priority date.

Further, the grant of a patent only secures the copyright owner of the program protection in Australia. If the owner wants to secure international protection in his or her major target markets then international applications (called PCT Applications or Convention Applications) will be necessary, again with all their attendant costs and delays. To complicate the matter some countries (especially the United States) have more lenient rules than those applying in Australia. Accordingly, it is possible that an inventive computer program would be patentable in the United States but not patentable in Australia.

A word of caution must now be sounded. It has been assumed to this point that you, as computer program copyright owner, may be in a position to secure the grant of a patent. What if another owner has already applied to register an invention disclosed in a computer program that is of the same nature and purpose, design and functionality as yours (albeit that it is written with a different and independently created code). You may at this point be in extreme jeopardy. Not only may the time, trouble and expense you have already expended count for nought but you may, from the date of publication of the other program, be infringing the rights of the other computer program owner. Knowledge is not required to establish infringement (and in this regard you are referred back to the definition of 'exploit' given previously in this paper), so that innocence or lack of bad faith or lack of intention will be no defence as such, although it may have some bearing on the remedies available to the plaintiff. It is outside the scope of this paper to consider any further the nature of the remedies available to a successful plaintiff. Suffice to say that a plaintiff has remedies, depending on the circumstances, in the nature of injunction, damages or an account of profit.

An obvious strategy that should be considered by a computer program inventor before embarking too deeply into a project or development is the carrying out of a patent search. Such a search is far from perfect but it is nevertheless worthwhile. The imperfections lie firstly, in the absence of a specific category for e-commerce related inventions (this is a matter that will be discussed briefly later in this paper), secondly, because the applicant for the patent drafts the claim and in so doing the applicant will inevitably use different terminology, key word searching will be problematic and finally, in the fact that a search will only reveal published or granted patents but will not reveal patent applications that are currently in the examination process. Patent search facilities are readily available on the Internet.<sup>2</sup>

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<sup>2</sup> Three sites worthy of a visit are to be found at [www.ipaustralia.com.au](http://www.ipaustralia.com.au), [www.ibm.com/patents](http://www.ibm.com/patents) and [www.european-patent-office.org](http://www.european-patent-office.org)

## SCOPE OF PATENT AVAILABILITY

The scope to apply for the grant of an inventive computer program is endless. As we have already seen, the system allows the registration of products and processes and processes can include inventive ways of doing business.

“... new algorithms for compression, encryption, searching, indexing or authentication can all be the subject of a patent. Algorithms developed specifically for e-commerce applications can be patented, such as targeted advertisement delivery algorithms. A patent on an algorithm can be extremely broad, covering any implementation of the algorithm, regardless of the computer language, operating system or processor that is used. New e-commerce applications and architecture can be protected; for example, an online banking application, an electronic shopping cart, a smart card system or an electronic Robin presentment architecture.” (Swinson & Middleton, 2000, page 73).

## SOME EXAMPLES

At this point it is opportune to provide four examples of e-commerce patents that have been either claimed or granted in recent times. It was reported in August 2000, that an application for a patent had been lodged in the USA seeking a patent in the USA and thirty one other nominated countries for software covering computer to computer international trade over the internet including electronic custom declarations, shipping documents, currency conversions, the calculation of air, sea and truck freight rates, insurance and letters of credit. (Wall Street Journal, 2000).

Another example is to be found in the (so far) successful grant of a patent to Amazon.com of its so called ‘one click’ technology. (US Patent No 5,960 filed September 97, issued September 1999). The technology allows customers to make online purchases with one click without having to go to the trouble of entering again credit card, shipping and other details. The patent is not really for the underlying technology that makes ‘one click’ possible, rather it is a patent to protect a business method being “A method and system for placing a purchase order via a communications network”. Immediately after the grant of the patent Amazon.com enforced, by way of a court injunction, its patent against one of its main competitors, namely Barnes and Noble. In relation to this case three things are worthy of mention. Firstly, Barnes and Noble are challenging the validity of the patent which reminds us of a fundamental principle of patent law in that the grant of a patent does not guarantee its future validity in Australia (section 20 of the Patents Act) or anywhere else. The system is basically self enforcing and validity is always a matter to be determined by the courts and even success by a patent holder in one court case does not prevent a subsequent challenge to validity by another competitor. Secondly, subsequent to the grant of the patent, Apple Computer Inc entered into an agreement through which it would pay Amazon.com a licence fee to use the ‘one click’ business model. Thirdly; it was reported by CNN in May 2001 that the Japan Patent Office had preliminarily rejected Amazons application on the basis that it had found prior art which evidenced that others had invented the idea prior to Amazon.com.

Another example is to be found in a patent infringement case instituted in April 2000 by Geoworks Corp v Phone.com. The plaintiff claimed a patent over flexible user interface technology used on all devices including mobile phones, which are based on the wireless application protocol specification and placed into the stream of commerce. In effect, Geoworks Corp is arguing that its patent is for a method of computer programming that formats content to appear on any handheld device. Whilst companies such as Toshiba Corp are paying licence fees, Phone.com has challenged the patents validity (Schwartz, 2000).

The final example is to be found in the patent granted in 1999 to Priceline.com for the method and use of buyer driven commerce. Priceline.com patented (US Patent No 5,794,207) a business method together with the technical system that makes the business method operate. What Priceline.com had in fact ‘invented’ or developed was a system of ‘reverse auction’ where buyers could bid a price (with accompanying terms and conditions) for things such as airline tickets or cars from unknown sellers and the buyers ‘guaranteed’ their offers through the use of credit cards. Priceline.com would then present the offers to sellers who could take them up on a first come first served basis. Priceline.com would then complete the transaction. It is worth noting that Priceline.com started court proceedings against Microsoft in 1999 claiming infringement of this patent and whilst the claim has been settled ‘in confidence’ reports indicate that the settlement financially favoured Priceline with Microsoft further agreeing to pay, on licence, for the future use of Priceline’s inventive technology.

## HOW POPULAR IS PATENTING?

As things presently stand within the patent system, it is impossible to know with any degree of certainty how many e-commerce computer program related inventions or processes have been registered, or are the subject of applications, around the world. The inability to quote appropriate statistics is occasioned, in large part, because of the broad way patents are classified and because there is currently no single worldwide classification system. E-commerce does not have its own category classification. Accordingly; e-commerce applications are, as a general rule, classified according to the technology and not the areas in which the technology can be implemented. Most computer program patents originate in the United States and whilst the figures are not certain estimations have been made that in 1998 alone 23,000 patents were issued by the US Patent and Trademark Office in the data processing, computers and communication group which includes software patents (Sanburg, 1999).

It is clear that many of the worlds major corporations (such as IBM, Apple, Microsoft, American Express, Mastercard, Sony and Ericsson) are, at present, heavily involved in patenting internet related inventions.

The four patent examples mentioned above were chosen, in part, because they illustrate one of the ongoing arguments or concerns that haunts the e-commerce/patent industry. If you were to consider the patents granted in the four examples, would you consider some or all of them to be 'inventive' or would you say that some or all of the were obvious steps that have taken into the online world what has, for a long time, existed in the offline world? The argument probably has no answer at present. Suffice to say, if you have seen or identified an unsolved problem and you have created a solution to that problem then, on the face of it, for right or wrong, your solution is probably patentable.

Another concern in relation to e-commerce related patents lies in the fact that some of them purport to cover extraordinarily broad claims. If you consider the Geoworks Corp example (above), if the patent is valid as currently claimed it then covers almost any wireless device hooked up to the web. We must not forget that, irrespective of the patentee's claim, if the claim covers already existing products or processes then to the extent of the 'overclaiming' that claim will either be not accepted by the Patents Office or, if accepted, be invalid when subjected to court challenge.

## CONCLUSION

The cost of securing the grant of a patent will preclude many copyright owners of 'inventive' computer programs from making an application. For those that are in that boat, copyright law will remain their principal source of protection. It is free and automatic and, given Australia's treaty arrangements, it has some meaning on the world stage. The protection offered to such owners has recently been bolstered by legislative reforms in the areas of technological protection measures and rights management information. Such owners, however, face the ongoing risk of their ideas being 'stolen' not through the copying of their computer codes but through the independent recreation of the functionality of their program. In a perfect world, such owners would be well advised to speedily move towards securing the additional protection offered by patent law. Patent law is not without its problems nor its detractors but nevertheless it remains a powerful government granted monopoly right to exclusively exploit the ideas, product or process embodied within a patentable computer program.

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# Fire, File and Forget: Why E-mails Often Fail

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## ABSTRACT

*E-mail is widely recognised as an important part of business communications, but we live in a world where we 'fire and forget' and 'file and forget' our e-mails. The people who send them expect the recipients to read and act. Senders transfer responsibility to the receiver. Complete communication is a two-way (duplex) process and, in technical terms, e-mail communication often is a simplex process, where a message is sent, responsibility transferred, and a response not given. This tension between the two has the potential to reduce the efficiency of organisations and individuals.*

*As the status of e-mail becomes elevated to a mass marketing tool and an intrinsic component of e-commerce, it is increasingly important that organisations grasp how users deal with the technology, and understand the legal obligations of both the employer and the employee. This paper attempts to define some of the problems of e-mail so that organisations can begin to consider how they will manage a growing issue - exacerbated by an increase in the use of e-mail by mass marketers - and to develop strong customer relationships through the sensible use of e-mail.*

## INTRODUCTION

E-mail is one of the oldest and most widely used technologies on the Internet and it is still the perfect medium for the simple exchange of information. However, it is not effective if it is not read or if the recipient simply files it and forgets to respond. This is becoming an increasing problem in organisations that rely on the e-mail as a formal and major communication channel.

According to Townsend (2000), e-mail users will experience a fortyfold increase in commercial e-mail by 2005. It is not difficult to envision the likely consequences as the sheer volume of e-mail messages they receive daily more and more frustrates users. Users will simply not find the time to respond to all the messages.

Busy executives no longer rely on secretaries to filter information for them - it all comes to their desktop via the e-mail and this is a major problem in terms of organisational efficiency. These people no longer have someone to ensure that follow up happens.

## WHAT SOME OF THE RESEARCH SAYS

Is the fact that we file and forget our e-mails a reflection on the technology? Is it a reflection of the fact that many people still find keyboarding painfully slow and so they file or print off the e-mail to be done at a later date - never to get round to it? A brief survey conducted by the authors discovered that lack of keyboarding skills was a major barrier to immediate response to e-mails, another was lack of ability to plan time due to the fact that e-mails come in all day, rather than the once a day routine of snail mail. The survey also found that the physical appearance of some e-mails caused the recipients to ignore them - they were too hard to read, too long, or the subject line did not accurately reflect the content of the message.

It has been found that only 13% of top USA companies answered an on-line query within three hours (Brightware, 2000, cited in Leitch *et al.*, 2001). The latter authors conducted a survey of Australian companies, both Australian and Victorian and found that 71% of national companies responded to an e-mail sent by the authors, 13% did not respond, and 7% were undelivered. Compare this with the State-based companies, 60% of whom replied to the e-mail, 27% did not reply and 13% were undelivered. The undelivered e-mails were mainly due to incorrect e-mail addresses being supplied. It is interesting to note that twice as many local companies ignored their e-mails compared with national companies. This may mean that, as yet, local companies have not realised the importance of e-mail as a communications channel and as a customer relationships management tool. If companies are to compete in the global marketplace, they may need to look at their e-mail management as the first line of attack.

Of the 43 national organisations who responded to the survey by Leitch *et al.* (2001), 11 turned their e-mails around within an hour, 11 took between 3 and 9 hours, and 1 organisation took 2 days, 6 hours and 46 minutes. Of the 45 local organisations, 10 turned the e-mails around in less than an hour, 10 responded within 3 to 9 hours, and 10 took more than 30 hours, with the slowest taking 4 days, 8 hours and 46 minutes. If these figures can be generalised to business at large, then it is obvious that these levels of response rates are unacceptable to organisations trying to build customer relationships through on-line communication channels.

E-mail has become a popular channel of communication because of the release from barriers of communicating within time zones and countries. As we become more globalised we need to communicate outside the barriers of time and space, and e-mail is the perfect medium for doing this. E-mail publishing can handle delivery of such e-mail content as newsletters, product and service updates, and companies are out-sourcing e-mail-marketing campaigns to disseminate news about products and to foster community among customers (Gardner, 1998).

Part of the appeal of e-mail is the advantage it gains from being a comprehensively digital process - the messages are created via a digital means, attachments are all digital and it appears on the recipient's screen in a digital form. This makes it a flexible and useful means of communication. It also makes it hard to avoid. E-mails come in automatically to most computers attached to a network, the recipient is notified whether there is new mail, and it is easy to be 'spammed'. (Spamming is the act of sending e-mail advertisements that people did not request and do not want).

## ISSUES WITH E-MAIL

This new technology brings risks with it. Users will receive unsolicited e-mail content such as newsletters, product and service updates, technical support bulletins, and general marketing content. There is also the issue of errant e-mail loops that can cause hundreds of meaningless e-mails to flood inboxes of prospective customers.

The Web contains a plethora of handbooks written by organisations for managing the 'netiquette' of e-mails. There are several simple techniques for ensuring that the recipients read e-mails. E-mail is a form of business communication, and as such, should be formatted to be readable and attractive. Much e-mail is written hurriedly with little thought to layout, style, grammar, or spelling. This creates a communication barrier for the reader. Any business communications book spells out the value of presentation of written communications to ease the task for the reader, but the sender does often not put e-mails into this category.

E-mail is still considered to be an informal means of communication, leading the recipient to delay responding until more important tasks are completed. The fact that e-mail is essentially a private means of communication, with no central logs being kept of messages received, exacerbates this situation, as records are often not kept of turnaround times for responses.

Another reason for people ignoring e-mails is that they are simply overwhelmed by the volume coming to their desktops daily. A suggested strategy is to turn off the new e-mail announcement, and set aside specific times in the day for checking e-mails.

According to Nielson (1993), e-mail is becoming an immense productivity sink. People are finding that they spend all day reading and responding to e-mails and that they are fighting to do any real work outside of the e-mail system. One response to this is to read e-mails and file them until the recipient has the time to respond in a considered and informed fashion. Of course, in the majority of cases, this time does not come and many e-mails disappear unanswered.

A far more sinister issue, as far as the organisation is concerned, is that of formal record keeping. Unless the organisation has a policy on e-mail, there is often no support for filing and records management of incoming and outgoing e-mails. It is vital that organisations have systems in place to ensure the capture of vital records produced via e-mails.

One of the greatest challenges to management is the lack of awareness that e-mail records actually exist. (Main, 1998). A review of several textbooks on records management on the authors' bookshelves highlight the fact that even recent books fail to mention e-mail management. It is very often the sender and receiver who determines which e-mails should be kept, and in what form. These saved messages are often stored on a local machine, only accessible to the user, thereby proving to be unavailable to the organisation. Most employees would never send a memo and not keep a copy, yet they will often fire off an e-mail without keeping a hard copy or filing the soft copy in a suitable location.

As e-mail becomes the solution of choice for many mass marketers, the amount of junk mail delivered to an executive's desktop is growing exponentially. E-mail has shifted the burden of organising, indexing and storing the information onto each employee, many of whom are incapable of managing the information they receive. This lack of formal records management of e-mail is causing it to become a 'black hole' in many public and private sector organisations (Sutton 1996). Organisations are now working hard to develop policies and procedures for capturing e-mail as records within an electronic environment, but these policies and procedures will also need to mandate how employees treat e-mails in terms of managing them and their native metadata.

## LEGAL ISSUES

Inappropriate use of e-mail raises a wide range of legal issues. Legal concerns are to be found in areas such as defamation, harassment, discrimination, privacy, consumer protection, and stalking. It is beyond the scope of this paper to consider any of these legal issues in any detail, but a few matters that are illustrations of some of the issues will be raised.

Perhaps the area that is of most current interest is to be found in the area of workplace e-mail. Most court decisions have favoured the view that an employer has the right to monitor an employee's e-mail notwithstanding that the monitoring is arguably an infringement of the privacy rights of the employee. The law has probably taken this stance because of a concept known as 'vicarious liability' which has the effect of making an employer liable or responsible for the actions of the employee.

As an example, in 1997 an insurance company in the UK, Norwich Union was forced to pay, following a defamation action, a competitor corporation £450,000 because the employees of Norwich Union had disseminated, via unauthorised e-mails on Norwich's computer system, statements or rumours that suggested that the competitor corporation was approaching insolvency.

There is obviously a need for the regulation of workplace technology to ensure that it is used fairly and appropriately by both employer and employee. Given that an employer is able to monitor its employee's e-mails, it is vital that the employer puts in place a clear and comprehensive e-mail policy in order that employees properly understand their responsibilities. The policy must be clear as to what activities are prohibited and permitted.

A useful sample policy is to be found at <http://www.collegehill.com/ilp-news>. The Australian Privacy Commissioner has published 'Guidelines on Workplace e-mail, Web Browsing and Privacy' which are to be found at <http://www.privacy.gov.au/publications/fs7.html>. Whilst the guidelines are not legally enforceable, they are both valuable and informative and attempt to strike a balance between privacy concerns, freedom of information concerns, and the employer's interests.

In a recent federal court case against Ansett Australia, based on 'unfair dismissal', the court found in favour of the employee. The dismissal by Ansett had been based on 'e-mail misconduct'. The case is useful in that it makes it clear that for an employer to rely on such a claim, the employer must be able to prove that an unauthorised use as defined in the employer's policy has occurred, that the investigation was conducted in accordance with the employer's disciplinary policy and that the employee was given an adequate opportunity to answer the allegations. The consequences to an employer who has not 'fairly dismissed' are things such as reinstatement orders, compensation and penalties (*AMAC&S Union v Ansett Australia Ltd*).

## SOLUTIONS

Although the problem of e-mail management is growing exponentially on an annual basis, solutions are gradually being applied. In the area of workplace emails, a restatement of the key Privacy Commissioner's guidelines is as follows:

The policy should be promulgated to staff and management should ensure that it is known and understood by staff. Ideally the policy should be linked from a screen that the user sees when they log on to the network.

Consultations with staff may also be useful.

The policy should be explicit as to what activities are permitted and forbidden.

While it is for each organisation to determine what it considers to be appropriate usage of its system, to simply say that all activity must be 'work related' may not be clear. There may be scope for guidelines outlining what personal use of e-mail both within the organisation and externally, to other organisations, is appropriate. Other activities may be specifically prohibited, eg the use of e-mail to harass, flame or defame or disclose information, or to transmit pornography.

The policy should refer to any relevant legislation.

The policy should clearly set out what information is logged and who in the organisation has rights to access the logs and content of staff e-mail and browsing activities.

Staff e-mail boxes will normally contain the e-mails they have sent and received. Back-ups and archives may also contain copies of e-mails that have been deleted by the user. As well as the actual content of messages, the date and time the message was transmitted, received and opened and the e-mail addresses of the sender and recipients will normally be recorded.



The policy should outline in what circumstances IT staff can legitimately access staff e-mails and browsing logs.

The policy should also indicate, in general terms, under what circumstances an organisation will disclose the contents of e-mails and logs. Many organisations will only do this on the production of a legal authority.

The policy should refer to the organisation's computer security policy. Improper use of e-mail may pose a threat to system security, the privacy of staff and others and the legal liability of the organisation.

The policy should outline how the organisation intends to monitor or audit staff compliance with its rules relating to acceptable usage of e-mail and web browsing.

The policy should be reviewed on a regular basis in order to keep up with the accelerating development of the Internet and information technology. The policy should be re-issued whenever significant change is made. This would help to reinforce the message to staff.

One of the other issues discussed in this paper, is the notion of management of the volume of e-mails. Nielson (2000) has proposed the idea of *contact tokens*. Contact tokens are encrypted data that can be given to customers or users to allow them priority access to your e-mail system. There can be various levels of contact token, from high priority to low priority. They can be valid for as long or as short a period of time as the e-mail owner determines. If the recipient of e-mails wishes, any e-mail that does not include a contact token can be given a low priority and could be discarded unread. This, of course, has serious implications for the first contact on an important issue. Senders can also buy contact tokens by purchasing them from the recipient, probably for micro-money. This however, may simply make the cost of mass marketing slightly higher and therefore may deter the less affluent organisations or individuals.

A version of this system is being used by many medium to large organisations, whereby an individual (individual A) sends an e-mail to another individual (individual B), and contained within that e-mail is an encrypted code that allows individual B clear e-mail access to individual A. Without the code, individual B's e-mails would be rerouted to a server without necessarily ever being delivered to individual A. The theory behind the system is that unsolicited e-mails are prevented unless the parties have established a personal relationship.

Many large companies are now tackling the issues of e-mail response and turnaround. National Semiconductor, for example, has 19,000 employees worldwide and it is often difficult for customers to target their e-mails to the correct employee. The company designed e-mail forms on the Web site so that e-mails would be directly routed to the product managers and technical support people responsible for each product. National Semiconductor guarantees a turnaround of forty-eight hours on customer e-mails. Instead of having a small number of customer service representatives answering e-mails, the company has more than 8,000 employees who may receive and answer customer queries. They also track and log all e-mails in a database so that they can ensure the e-mail is responded to and employees can see responses made to similar queries, thus ensuring consistency of response. If the recipient of the e-mail cannot deal with it, it is automatically re-routed to someone who can respond effectively.

Tripod is another company who have created a vibrant web-based community of more than a million members. One of their aims is to turn around 90 percent of customers' e-mails within 24 hours. Much of this process is automated, with intelligent agents scanning the subject and content of incoming e-mails and automatically generating answers from the company's FAQ knowledge base. These automated responses are then routed to a customer service representative who personalises the response.

## CONCLUSION

E-mail is becoming widely accepted as a central part of the communications strategy of most organisations. As organisations look to refining their customer relationships management as part of their competitive strategy, it is essential that e-mails are managed properly.

The current 'fire, file or forget' attitude of many company employees to their e-mails has the potential to hurt an organisation's competitive edge and surveys conducted by both Brightware (2000) and Leitch, *et al.*(2001) highlight the sometimes cavalier attitude employees have towards e-mail as a form of communication.

Organisations also need to take responsibility for ensuring that employees have the tools and resources to manage the increased pressures that e-mail brings to their jobs, and to investigate policies and procedures for sending and answering e-mails.

A further issue is that of electronic document management systems - employees must be conversant with their legal and organisational obligations as far as ensuring that e-mails are archived and transferred to the central records management system.

E-mail has been with us for over 20 years and has evolved with its own culture and management systems. Many organisations have only adopted e-mail as a serious communication channel within the last eight years and have, in many cases, not addressed many of the issues outlined above.

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# INVESTIGATING ERP SYSTEMS USING STRUCTURATION THEORY – A CRITIQUE

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## ABSTRACT

*There have recently been increasing calls for a greater social focus and increased use of interpretive methodologies within the IS field (IFIP TC8 WG8.2, 2000). This paper suggests that a relatively new social theory, critical realism, has the potential to add new insights to research in the information systems field. The paper introduces critical realism by contrasting it with the use of Structuration Theory in the IS field. In contrast to many earlier social theories structuration theory along with critical realism attempts to address both agency and structure in their theoretical frameworks, however the way of representing structure and agency is fundamentally different within each approach. The paper presents the different conceptions of structure and agency within each theory and discusses how the study of ERP systems can depend on how structure and agency are perceived. It argues that critical realism is a useful approach to examine ERP systems since it provides a strong recognition of the role of structure in social situations. ERP systems are enterprise-wide integrated systems that have strong structural impacts on the organisation and the users themselves - it is important that the underlying research approach reflects this important component. The paper concludes by examining whether web-enabled ERP fundamentally changes this structural focus.*

*Keywords: Critical Realism, Social Theory, Enterprise Resource Planning, Structuration Theory*

## INTRODUCTION

Avgerou (2001) argues it is important that IS practitioners consider the social context in which IS Development takes place and also the broader organisational processes under which it operates:

Most of the knowledge developed and taught in the IS field promotes a normative professional practice, based on a limited perception of context. Broader organizational processes are usually outside the perceived terms of reference of IS practice. Further research is needed to develop appropriate analytical knowledge to equip professionals with capabilities to pursue contextualist analyses.

In a similar fashion Garcia and Quek (1997) argue it is important to address both the objective and subjective side of an information system. Probert (1997) argues that Information Systems do have objective, touchable realities and he disputes the 'facile tendency to treat information systems as, by and large, subjective constructs' (p. 48). He suggests that the 'constant lurching between the (supposed) binary opposites of subjectivism and objectivism' is not useful. 'Information systems are not purely subjective constructs - they have objective features such as processors, storage media, etc.' (p. 49).

Garcia and Quek (1997) point out the difficulties in defining the actual object of information systems research - 'Is the object of research in information systems of a technological or social nature? Is it the organization, an information system or a social system?' (p. 450). A recent IFIP conference on Organisational and Social Perspectives on Information technology examines some of the social and organisational issues involved in IS Research (IFIP TC8 WG8.2, 2000). At this conference Jones (2000) examines the number of citations referring to social theorists in the IFIP WG8.2 conference literature as a means to determine the level of interest in the use of social theory within IS. Over the period 1979-1999 57% of papers had references to social theorists - the four major theorists being Giddens, Habermas, Foucault and Latour. The paper suggests that it might be useful to widen the range of social theorists used in IS. This article addresses this suggestion by arguing for the use of a relatively new social philosophy Bhaskar's (1978, 1979) critical realism.

Bhaskar's critical realist philosophy provides an opportunity to avoid this all or nothing approach by developing a philosophy grounded on a recognition of both the subjective and objective domain. Realism as envisaged by Bhaskar (and referred to by Searle (1995) as external realism) argues that there exists a reality totally independent of our representations of it; the reality and the 'representation of reality' operating in different domains - roughly a transitive epistemological dimension and an intransitive ontological dimension. Real objects are subject to value-laden observation.

As Bhaskar points out in a recent interview:

This means that there is no conflict between seeing our scientific views as being about objectively given real worlds, and understanding our beliefs about them as subject to all kinds of historical and other determinations. (Norris, 1999)

An important part of the philosophy is its conception of social structures and agency interaction with such structures.

## CONCEPTIONS OF STRUCTURE AND AGENCY IN SOCIAL THEORY

Traditional research approaches have tended to emphasise structure *or* agency, rather than structure *and* agency. This has been necessitated by the difficulty in arriving at a comprehensive theory that has incorporated aspects of both. Giddens's Structuration Theory is a recent attempt to incorporate both elements but this theory has proven difficult to operationalise.

By concentrating on either micro/agency or macro/structure traditional research has tended to be one-sided in its focus. This one-sided focus affects how research ensues, as Walsham (1993, p. 6) argues:

'Theory is both a way of seeing and a way of not-seeing - a particular theoretical perspective can blind researchers to other perspectives at its moment of application'. The concentration on one or the other of structure or agency has led to difficulties in explaining the intricacies of social situations. Individualists are committed to social atomism, 'that is to the claim that the important things about people can indeed be identified independently of their social context' (Archer 1995, p.35) - individuals are seen to be the ultimate constituents of the social world. In contrast the collectivist sees society as more than simply the sum of the individuals - society can be viewed holistically as having emergent properties that cannot be explained solely through examination of its individual components.

Archer (1995) argues that the ongoing conflict between micro and macro views of society and the problem of agency and structure is an important and recurring debate within the sociological field. She feels that the importance of such an issue requires that all social theorists (and social investigators) define their stance with respect to this fundamental issue. The difficulty in understanding social reality is in the need to understand both aspects of structure and agency. Archer (1995) sees society as an answer to a number of riddles:

What is it that depends upon human intentionality but never conforms to their intentions? What relies on peoples' concepts but they never fully know? What is it that depends upon actions but never corresponds to the actions of even the most powerful? What is it that has no form without us, yet which forms us as we seek its transformation? And what is it that never satisfies the precise designs of anyone yet because of this always motivates its attempted reconstitution? (p.165).

Similarly Scott Poole & Ven de Ven (1989, p. 564) discuss some of the ensuing structure/agency paradoxes evident within organisational theory:

The difficulty in reconciling the explanation of behaviour as a function of structural determination with the equally strong claim that it is the product of purposive action;  
Good arguments for two incompatible conceptualizations of organisational climate – as an aggregation of individual climate perceptions or as a macrolevel system property;  
The question of whether social organisations are fundamentally stable orders or continuously changing emergents;  
The trade-off between the need to establish individual identity in groups and the collective nature of group action.

Archer (1995) discusses how the two historical approaches to social investigation – *upwards conflation* (which treats social structures as free creations of social agency) and *downwards conflation* (which treats social activity as determined by structural factors) are inadequate to explain the complexities of social situations. She suggests that whilst social research traditionally has rested on these two fundamentally different ontological foundations, in order to understand how individual action impacts on social situations there is a need for an *analytical* dualism. That is, in order to properly explain social situations both elements need to be separately recognised in order for their interaction to be investigated. She recognises that whilst in reality structure and agency cannot be separated, the practicality of studying structures and their effects requires an analytical separation.

Reed (1997) argues against theories which emphasise single level micro focussed aspects of organisational situations; he dislikes their 'one-level, process-dominated social ontology and [its] inherent analytical tendency to collapse agency and structure into localised or micro-level social practices... they work with 'flat' or 'horizontal' social ontologies in which the processual character of social reality totally occupies the analytical and explanatory space available for...organization analysis' (p.24).

Reed criticises ethnomethodology and actor network theory which he sees as sharing a common focus:

The ontological status and explanatory power of 'structure' - i.e., as a concept referring to relatively enduring institutionalized relationships between social positions and practices located at different levels of analysis that constrain actors 'capacities to `make a difference' - is completely lost in a myopic analytical focus on situated social interaction and the local conversational routines through which it is reproduced.

'Structure' plays a critical role in the examination of organisational situations – it is useful to highlight some of the different perceptions of structure.

## STRUCTURE AND ERP SYSTEMS

Archer (1995, p. 104) discusses a number of different conceptions of social structure (from Porpora 1989). Four major conceptions of structure are discussed:

- structure as 'patterns of aggregate behaviour that are stable over time' (from Methodological Individualism).
- structure as 'lawlike regularities that govern the behaviour of social facts' (from Methodological Holism).
- structure as 'rules and resources which are implicated in social practices and have no existence independent of them' (Giddens' Structuration Theory)
- structure as 'systems of human relations among social positions' (Methodological Realism).

Each of these perceptions of structure can provide useful explanations of the effect that ERP Systems have on organisations. ERP systems are enterprise wide systems that often require the implementation of so-called "best practice" process models. These best practice process models define optimal processes for the particular industry under which the organisation operates. Often existing user processes are radically changed - the structural impact of ERP systems is very high and needs to be taken into account in examining their effects. Each of the four conceptions of structure can highlight different aspects of the structuring impact of ERP systems.

Archer (1995) argues that the first individualist definition is insufficient 'primarily for its explicit atomism, secondly for its assumption that nothing but a process of aggregation is involved in structuration, thirdly for making the visible pattern reproduced synonymous with 'structure' and finally for the presumption that to be a structure *is to be* relatively enduring' (Archer 1995, p. 105). For ERP systems such a perspective would allow a careful examination of the work routines and individual experiences with ERP systems but would not provide a basis for examining the over structural impacts of the technology.

Similarly the collectivist perspective on structure is rejected 'firstly for the explicit reification of structure by its severance from action, secondly, for its assumption that regularities are lawlike in producing ineluctable consequences, thirdly, for holding that these operate in steam-roller fashion immune from human intervention, and lastly, for assuming that structures endure and unfold over the heads of actors like mechanical and naturalistic forces' (Archer 1995, p. 105).

ERP Systems are hugely complex systems that can impose constraints on operating users – a definition of structure based on methodological holism can usefully represent such aspects of ERP in that it would see the 'system' as a powerful and inflexible imposition on work practices and individual action. Yet such a perspective tends to reify ERP systems and ignore potential adaptability and agency interaction with such systems. In a criticism of systems approaches Collins (1998, p.150) argues:

It seems, then, that when we come to account for the nature and contours of organisations, it is systems, not people, who do things. As a result there seems to be little room for people to interpret their role within organisations, and make judgements based upon these interpretations as to how to act. Instead it seems, the behaviour of people is programmed by the role they perform. With the role of interpretation and perception downplayed, the system and its boundary take on a concrete rather than an analytical role, and so the system apparently enforces itself on members of the organisation rather than being something which people have room to interpret, debate and dispute.

This privileging of structure over action is termed by Collins as reification. Hyman (1975, p.13 as quoted in Collins (1998, p. 151)) defines reification as:

Treating abstract collective entities which are the creation of human activities, as the active agencies in social relations and in consequence, devaluing the part played by human actors.

The collectivist perspective on ERP systems has much to offer in examining ERP installations as detailed in the following quote which tends to reify the SAP system:

SAP R/3's broadest impact on the Company has been its influence on the corporate culture. Prior to the R/3 implementation, there was a perceived high degree of disorder. While the Company does not yet exploit all of the information available from the new IT system, the system has provided a much greater sense of control and has had significant impact on how employees approach their responsibilities. R/3's tightly integrated data model has taught people that they must perform functions as they are supposed to be done. (The ROI Report, 1997, p. 12)

As discussed below such a collectivist perspective may be less valid in examining ERP systems with e-business extensions given the empowering possibilities of such extensions.

The third conception of structure is proposed as a means of accommodating both views. As Whittington (1994, p. 62) argues Giddens 'inserts the concept of 'system' between the two [structure and agency] in order to create what he calls an interdependent 'duality'. Social systems are constituted by the activities of human agents, enabled and constrained by the structural properties of these systems. These structures define both the rules - techniques, norms or procedures - guiding action, and the resource - authoritative and allocative - empowering action. However, while structural properties make action possible, structures themselves have no reality except as they are instantiated in activity or retained mentally as remembered codes of conduct or rights to resources'.

This concept of structure provides for a virtual existence for structure and sees structure as having no existence external to agency - they are functionally inseparable - structure only becoming real when instantiated through agent's actions. Structural properties are generally reinforced through the comfortable rule following and routinised behaviour of knowledgeable agents - so that for example, an educational system is not an identifiable form of social organisation but a visible pattern 'produced by agency manipulating rules and resources in ways which perpetuate this patterning' (Archer, 1995, p. 107). Yet as Whittington (1994) points out Giddens argues for the importance of choice in agents actions in that the actor is knowledgeable and is not passively embedded in social systems but actively engaged in their constitution. Rule interpretation is a major activity of Giddens' concept of the 'active agent' both in the way that they interpret complex internal organisational rules and in the way they apply the external rules gained through participation in systems outside the organisational system. An agent can only be an agent if they are capable of 'making a difference' - a passive accepting agent is not a part of Giddens model.

## STRUCTURATION THEORY IN INFORMATION SYSTEMS RESEARCH

Orlikowski (1992) provides an example of the use of structuration theory in IS when she investigates the implementation of CASE tools. She argues that technology 'be considered as one kind of structural property of organisations developing and/or using technology. That is, technology embodies and hence is an instantiation of some of the rules and resources constituting the structure of an organisation' (p. 405). The model developed by Orlikowski suggests the consideration of two modes of interaction - the *design mode* and the *use mode* (p. 408) to reflect the major modes of interaction between actors (the developers and users) and structure (the technology) at different points in time.

Volkoff (1999) also uses Giddens' Structuration Theory to analyse an ERP Implementation and in so doing highlights the role of the 'active agent' in changing and modifying the ERP system:

The adaptation of software and organizational processes is an iterative process entailing on-going social action that is clearly constrained by both the structural properties of the organization and the built-in properties of the software. The actions of the project team and other members of the organization will alter some of these properties and reaffirm others. (p. 236)

This theory does however tend to ignore the structural imposition of the complex ERP systems; its concentration on the active agent and micro change processes must neglect the long term macro level constraining nature of ERP systems.

The use of Giddens' framework and the representation of technology as structure raises a number of issues. As Archer (1995) argues Giddens' representation of structure makes it difficult to investigate the interplay of actors and technology over time. Orlikowski's model reduces the impact of this shortcoming by looking at two separate instantiations of technology, the *use mode* and the *design mode*. However whilst such separation is useful it does not allow for a full ongoing recognition of the interaction between developers, users and the technology over the often considerable time involved in systems design and implementation.

Another issue with Orlikowski's model is the equating of technology with structure, thus providing technology with a virtual existence, the technology only being 'made real' on instantiation. Such a model for technology does not encourage a deep investigation of the properties of the particular technology – these properties having the potential to impact later use and design. Giddens' framework cannot insist on a clear specification of virtual structures since they do not in fact exist until instantiated, they only exist as 'rules and resources'. Yet technology has emergent properties that cannot be represented solely as 'rules and resources'.

ERP systems are often implemented by adopting completely the best practice model included within the package – in this case the ERP implementation can be seen as purely a (big!) software package installation - such implementation places enormous structural constraints on organisational members. Volkoff (1999) discusses the constraining effects of ERP systems such as SAP or PeopleSoft:

Individuals at PFP made statements such as '[the software] changes the way you think about [a specific type of information] because SAP treats it differently...it was a big thought process change,' and that they had to 'translate user requirements into SAPanese.' At UNI one user talked about 'changing from trying to map from my world into PeopleSoft, to asking what will make this system work, mapping from PeopleSoft into my world.' (p. 236)

Such quotes indicate the predominating importance of structure in any analysis of ERP systems, yet their lack of specificity as to which aspects of the ERP systems provide the constraint is limiting. Structuration Theory is useful in defining agency roles and effects but without a clear recognition of the reality of structure and its emergent properties it is very difficult to properly analyse the particular properties of ERP systems and how they may constrain agents actions – ie the structural elaboration that ensues through agency action on the pre-existing ERP structure (in Archer's terms).



## THE CRITICAL REALIST INTERPRETATION OF STRUCTURE

In contrast to this virtual existence for structure the realist interpretation sees structures as referring to actual forms of social organisations, as 'real entities with their own powers, tendencies and potentials' (Archer 1995, p. 106). Such structures cannot be perceived and thus cannot be identified except through examination of their effects. Social systems depend on the relations between and within a plurality of structures, such relations having their own independent causal properties. The resulting system founded on the various relations has emergent properties which may affect agents acting within the system. This interpretation of structure is in contrast to Giddens' approach which is non-relational seeing structure as 'rules and resources'. Giddens' approach emphasises the role of the active agent; Bhaskar's realist interpretation elevates the role of structure and its shaping role in social situations.

Critical realism suggests:

- (i) That structure necessarily pre-dates the action(s) leading to its reproduction or transformation.
- (ii) That structural elaboration necessarily post-dates the action sequences which gave rise to it. (Archer, 1995, p.15)

The critical realist approach to structure is in marked contrast to Giddens' conception which suggests that structure cannot be separated from agency. Archer (1995) discusses a number of issues related to Giddens' representation of structure. One issue concerns Giddens' perception of structure as virtual, only becoming real on their instantiation – Archer argues that this necessarily requires that social theory concentrate on social 'practice'. Such concentration leads to what Archer terms as the over-active agent in that it ignores the possibility that agents may have a role to play in the elaboration of structures purely through their existence as part of a collective group; under structuration theory this passive role of the non-doing agent cannot be reflected. For Archer actors (non-doing agents) and (active) agents are different things and should not be 'elided' or combined as provided for in structuration theory.

Archer also argues that structuration theory does not allow for the separate investigation of the emergent and irreducible properties of structures and agents. In particular the collapsing of structure into agency negates the investigation of their interplay over time - how pre-existing structure may constrain action and how action reproduces or transforms existing structures. Critical realism argues for the consideration of both structure and agency and, specifically, brings time dependency into account. The central argument is that 'structure and agency can only be linked by examining the interplay between them over time, and that without the proper incorporation of time the problem of structure and agency can never be satisfactorily resolved' (Archer, 1995, p. 65). This is in contrast to Giddens' structuration theory which suggests that structure and agency are inseparable, one *sinking* into the other thus disallowing the study of their interaction over time.

Giddens' structuration theory and Bhaskar's critical realism provide an opportunity for the recognition of both structure and agency although both representations provide little real practical guidance.

## CONCLUSION

This article discusses a number of different ways of envisaging structure, such discussion prompted by the observation that ERP systems are real structuring systems that have important ongoing impacts on organisational life. A collectivist definition of structure as 'lawlike regularities that govern the behaviour of social facts' is a tempting means of examining the impacts of ERP on organisational life, however, as indicated above it does not go far enough in allowing a consideration of the ways that agents may amend the system and their own behaviour to adjust to such 'lawlike regularities'.

A more complete analysis has been attempted by the use of Giddens' Structuration Theory (Volkoff 1999). However, Giddens' structuration theory is difficult to operationalise; it is a varied and complex theory that Craib (1992) associates with the perhaps unkind metaphor of an omelette to highlight its complexity. As Craib (1992, p. 33) points out Giddens' theory 'is not, nor does Giddens claim or want it to be, a tight, logically deduced and interrelated theory' - it is a rich and varied theory that can provide useful and significant perspectives on the complexities of organisational life but provides little methodological guidance. As Rose (2000) argues Giddens Structuration Theory is difficult to apply within the IS field because of:

the absence of specific theories about how information technology is involved in the process of structuration  
Giddens' own disinterest in practical uses of his work – which leaves no path to follow.  
the relative inaccessibility of structuration theory to IS researchers and practitioners due to the different discourse style and specialised concept vocabulary of social theory. (p. 128)

For IS research it seems that the fundamental assumptions underlying the theory do not seem to mesh well with the 'reality' of technological systems. The critical realist perception of accepting a technological system as a pre-existing object with emergent and irreducible properties rather than as a virtual object only 'made real' through instantiation seems a more useful and practical representation. More practical research using this theory is required particularly in the examination of ebusiness extensions to ERP systems. Web-enabled ERP systems can provide new means of empowering users - the interaction of users and the different components of the underlying system need to be examined carefully in more detail. The critical realist interpretation seems a more useful means for examining the particularities of such systems and ERP systems in general.

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# Physical and Virtual Communities and the Not-for-Profit Web Site

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## ABSTRACT

*Development of a Web site for a not-for-profit organisation raises a number of issues. (1) It is difficult to measure the success of a not-for-profit, this difficulty extends to evaluation of the Web initiative. (2) A not-for-profit deals with a number of communities, Web site objectives must be clear as to which community is to be supported. (3) A Web site will extend the physical community into a virtual community, there must be effective infrastructure and support procedures for the new virtual community.*

## INTRODUCTION

Development of a Web site is a current initiative for many organisations. The Web site may change the nature of the organisation, by extending an existing, physical community into a new, virtual community.

Even in a for-profit organisation, success of a Web site may be more than simple profit-and-loss. A Web site may support other, more commercial activities, the success or otherwise of this support may be difficult to measure. Relating the success of a not-for-profit Web site to the not-for-profit organisational objectives will be even more difficult.

The not-for-profit must support three sets of stakeholder "communities": Those who provide the services, those who receive the services, those who fund the services. Each of these communities must be satisfied by the mission and operations of the organisation. At least one stakeholder community must be satisfied by the operations of the Web site.

This paper describes some of the general difficulties of measuring the success of a not-for-profit. The role of the community is then discussed. In particular, a new Web site may change a physical community to a virtual community. This change will bring with it a range of implications and requirements for support of the newly-formed virtual community.

This paper is part of a broader research project, studying Web site and e-business development in not-for-profit organisations which currently support a predominantly physical community.

## NOT-FOR-PROFIT ORGANISATIONS IN A COMMERCIAL WORLD

It is difficult to measure the effectiveness of the operations of a not-for-profit. A major obstacle is, that a not-for-profit is set up to satisfy a social need. This need may be hard to measure. It will be difficult to quantify the impact of changes of, or satisfaction of, a social need. The change due to one organisation's endeavors may also be difficult to isolate.

Where the overall objectives are not measurable, how can a not-for-profit measure the effectiveness of a single initiative such as the development of an organisational Web site?

There is strong pressure for change in the management of the not-for-profit organisation. In a review of several new books on management for the not-for-profit organisation, Renz begins with this statement:

THE world of the American nonprofit organization is changing in dramatic, complex, and dynamic ways, demanding that those who manage and lead these organizations fundamentally reconsider what it is that they do and how they do it. Confronted with an array of exhortations that they focus on quality, become entrepreneurial, assess outcomes, be accountable and transparent, and collaborate and create strategic alliances, and, to the ultimate chagrin of some, "behave like a business," sector leaders find themselves pushed to explore new paths to enhanced organizational success and effectiveness. (Renz, 2001)

Not-for-profit management will change. The organisation must become more accountable, it may need to act more like a for-profit organisation. No matter what the result, not-for-profit managers must at least examine new and different approaches to effective management.

Sawhill & Williamson's interview of a number of not-for-profits indicates that none have been able to develop an adequate measure of the success of the organisational mission. The not-for-profits have adopted many of the tools of the for-profit organisation, including strategic planning, marketing, finance, information systems, and organizational development. The one tool that still escapes them, is to provide a measure of success that is as clear as the for-profit report of "profit". (Sawhill & Williamson, 2001)

The interviews reveal three lessons. First, accurate measurement of the achievement of organisational goals is only possible if the goals are, in fact, measurable. For the not-for-profit, this is often not the case. Second, measures in use should be simple, and easy to communicate. Third, the measures may provide an effective means of marketing the organisation, in order to attract more funding.

The authors identify a number of organisations which have developed specific, actionable and measurable performance measures. On the other hand, these measures do not relate directly to organisational goals. The organisations have tacitly abandoned direct measures of success in favor of cheaper, faster and more useful surrogates of organizational performance.

Bryson, Gibbons & Shaye offer a new and different approach to measurement and management of a not-for-profit organisation: the "enterprise scheme" as an alternative to a "strategic plan". A not-for-profit has a dilemma: should it act as a charity, or as a business? The enterprise scheme links the need to balance social needs, stakeholder expectations and the need for long-term survival in a commercial world. (Bryson, Gibbons, & Shaye, 2001)

A not-for-profit does not have the simple goal of making a commercial profit. Bryson et al provide a number of alternate areas for measurement, some of which are discussed below. Measures from each area are combined into the enterprise scheme, to provide an overall measure of the success of the not-for-profit organisation.

*Understand social needs, understand stakeholder expectations:* A not-for-profit is generally set up to satisfy some social need, to provide goods or services to those who need them. The funding for these goods and services may be provided by a separate group, who thus become key stakeholders in the organisation. The not-for-profit objectives must satisfy both recipients of the goods or services, and those who provide the funds.

*Build and draw on core and distinctive competencies:* As with a for-profit, valuable core competencies of a not-for-profit do not guarantee success. There is competition in the not-for-profit sector, particularly competition for funds. The not-for-profit must compete on the strength of its distinctive competencies, those that cannot be duplicated.

*Cultivate legitimacy and support:* A not-for-profit is highly dependent, for gaining funds, on its public image. It must be seen as legal and ethical, as well as satisfying social needs that are supported by potential providers of funds. The public image must be both maintained and enhanced. Bryson et al wrap up their article with a warning. The enterprise scheme must be monitored, enhanced and, if necessary, changed. Yet a change to competencies, practices or the basis for organisational legitimacy may have repercussions such as loss of funder support. Change, warns the article, may be both difficult and inadvisable.

Other writers continue the theme, that simple measures of profit may not be an adequate measure of success, even in a for-profit organisation. Having used the Balanced Scorecard approach to for-profits, Kaplan, for example, applies the same principles of balanced measures to the not-for-profit organisation. (Kaplan, 2001)

There is increasing competition for funding, in the not-for-profit sector. Reports on receipts, spending and cost efficiencies may be essential. The not-for-profit must also track and control its initiatives – and this must be done in terms of the overall goals and objectives of the organisation. A multidimensional framework is required, to measure and manage the effectiveness of operational activities.

Kaplan has found that not-for-profits create complex and lengthy “strategy documents”. Yet these documents do not relate to overall objectives; They are lists of initiatives that may or may not relate to organisational objectives. The performance management system, then, becomes a list of measures of these initiatives. There may be no adequate measure of the effectiveness of the organisation in achieving its overall objectives.

An unclear strategy may mask internal disagreement on the actual strategy. Kaplan suggests the need for a clear strategy, with a performance management system to measure performance against that strategy. Including performance measures that directly relate to the strategy will then eliminate any conflict over the actual meaning and intent of the strategy. In an approach that is similar to the enterprise scheme, use of the Balanced Scorecard complements financial measures with measures from the perspectives of customers, process, learning and growth.

As described above, the not-for-profit faces difficulties measuring its own success. As an added complication, many not-for-profits are managed and operated largely by volunteers. Management strategies must be developed and supported by volunteer managers, operational requirements must be supported by volunteer staff. As with not-for-profit funders, volunteer workers must support the essential mission and style, or they may withdraw their support.

In order to maintain support from the volunteer staff, it is helpful to understand the general characteristics of people who volunteer. Reed and Selbee provide a statistical portrait of the Canadians who give more than the national median of 66 hours of their time each year as volunteers. (Reed & Selbee, 2000)

The Canadian volunteers have a number of common traits. They tend to have younger children, higher income and better education than non-volunteers. Active volunteers also tend to be active across a range of not-for-profit activities including charitable, social and civic participation. These common traits, however, vary from community to community. That is, active volunteers have different patterns of distinctive characteristics in different regions and communities of different size across the country. If the research by Reed and Selbee is applicable outside Canada, it has several important implications. Even within the one country, there is a range of “common” traits. A not-for-profit may need to vary its approach to volunteers, depending on the physical region of operation. Also, active volunteers have a number of not-for-profit commitments, each organisation must compete for the support of each volunteer.

Effective use of volunteers is a key factor in the success of the not-for-profit organisation. As social needs rise and government funding reduces, there is an increasing need to attract and retain volunteers. Understanding the characteristics of active volunteers is vital to any organisation which depends on volunteer participation.

## PHYSICAL AND VIRTUAL COMMUNITIES

A not-for-profit may be operating within a number of physical communities, where physical communities depend on physical proximity of members to support the essential interactions. Creation of a Web site will extend operations into a virtual community involving online interactions. Members of a virtual community may be physically remote from each other; they depend on computer-mediated communication for member-to-member interactions.

Communities exist with a range of values and purposes. The community has many roles, in many situations. Some simply exist, others are deliberately created. There is an equally wide range of means by which a physical or a virtual community may be built and supported. Several approaches to the purpose and support of a virtual community are discussed below.

Companies such as America Online and Amazon.com have built their success on the use of virtual communities. The majority of companies have yet to grasp the importance of these communities. "But before long," write Williams and Cothrel, "the ability to create and manage virtual communities will become a distinguishing feature of nearly every successful business." (Williams & Cothrel, 2000) Their paper provides several examples of the many forms of virtual community. In one example, Kaiser Permanente extends customer relations from the physical to the virtual community. About.com supports a virtual workforce, Ford Motor Company provides information to a community of actual and potential customers.

Each example has three critical areas of activity in common: member development, asset management and community relations.

McWilliam argues that an online community may be deliberately created in order to support an organisational brand. (McWilliam, 2000) The article provides strategies for development and management of a new community that will support a given brand of products. Key factors for a thriving community are: identification of individual community members by name, rewards for support, and a relationship between organisation and community members that develops over time.

The article describes the "opportunities of online communities" and provides rules for survival and growth. It recognises that a brand-based community is a special case of an online community, and there are management rules that must be deliberately applied. The final rule is, that the online community must always be an integrated part of the total brand strategy.

There are a large number of skills that are required for successful management of a brand-based online community. In the main, these skills are identified from existing communities, brand-based or not. Some skills, such as maintaining the balance between freedom of speech and the required "brand community values", are specific to this purpose-built style of online community.

In a less commercial example, Smith describes the growth of virtual "fan" and "fanzine" (fan magazine) communities, made possible by use of computer-mediated communication (CMC). (Smith, 1999) At its simplest, e-mail allows one-to-one communication. CMC through the Internet also supports the communal interactions that are necessary for creation, growth and maintenance of a community.



Internet and e-mail allow the presentation of material, and invitation to participate, that support the community. These strategies may be implemented, for example, through timely news items, useful databases, entertaining columns and recognizable images. These and other strategies contribute to the sense of community amongst physically separated members.

Shrivastava presents another example of a virtual community, one that replaces a traditional physical community. When formal education moves online, a virtual community of learning is created, with the common purpose of gaining knowledge for community members. The virtual community must allow the interaction and mutual learning that has previously only been associated with learning community members in close physical proximity. (Shrivastava, 1999)

The Internet allows meaningful interaction over a regional, national or global domain. To be successful, an online learning community builds on reciprocal expectations of mutual responsibilities, engagement, time involvement, and information sharing. Shrivastava presents a number of factors which must be provided in order for the community to successfully support its purpose. Community member expectations must be supported by: An institutional infrastructure of technology, organisational policies, and learning practices. That is, both physical and organisational support must be available.

### **COMMUNITY FACTORS IN THE NOT-FOR-PROFIT**

A not-for-profit organisation may provide important services within its relevant community. We need to understand what those services are: What is the contribution of the not-for-profit to its community? Backman and Smith argue that the not-for-profit may be an important part of the social network, that its operations may be one means of building the communications network that supports a community. (Backman & Smith, 2000)

Support within the community depends on the level of "social capital". Social capital such as trust, social support and cooperation is increased by horizontal ties and relationships, by the links between community members of equal standing. The effect is not so strong for vertical networks, such as the hierarchy of power that is typical of a commercial organisation. Commercial strategies that improve the vertical relationships at the expense of the horizontal, may improve organisational operations at the expense of the level of social capital.

In a changing environment, a community management style may offer better support than strictly hierarchical management. The goals of the organisations being studied may support horizontal or vertical relationships. That is, they may support the operations or they may support the community. It is difficult to support both.

Liedtka writes that any organisation may be viewed as a "community of practice". This view leads to a focus on the underlying system of community values, rather than the fragmented best practices approach. A community of practice resists traditional management, a new set of qualities is required in order to allow a successful community to evolve. (Liedtka, 1999)

A community of practice implies a set of values that flows from the individual to the organisation. Continuous learning and growth of the individual is seen as the cornerstone in growth of corporate capabilities. Individual members of the community are willing to listen to and understand the views of others, they are willing to challenge their own as well as other's thinking. There is a personal involvement with the work that leads to a sense of commitment, ownership, trust and optimism. The commitment is to purpose and to each other; the ownership is of outcomes and of the means to achieve them.

Collier & Esteban state that, "Organizations in changing environments need to become flexible, responsive and participative." In a "fractal" organisation the related factors of responsiveness, purpose and connectedness exist equally at the organisational, group and individual levels. There will be participative governance based on the exercise of freedom and creativity at all three levels. (Collier & Esteban, 1999)

Participative governance is both effective and ethical, say Collier & Esteban. Organisation members will exercise their freedom and creativity through various organisational communities: of practice, of discernment and of commitment. A small not-for-profit, run largely by volunteers, may already operate as a community, including use of participative governance. This, then, should be an advantage in a rapidly changing environment.

## **OBJECTIVES OF A NOT-FOR-PROFIT WEB SITE**

Web site development is a current initiative for many organisations, both for-profit and not-for-profit. Much has been written on technical issues for Web development. Sound commercial reasons have been discovered and stated, for the development of a Web site by a for-profit organisation. The difficulties of measuring the success of a not-for-profit, however, apply equally to measuring the success of a not-for-profit Web site.

Not-for-profit organisations clearly need objectives and measures of success that are not purely commercial. Even in a for-profit organisation, a Web site may provide support for functions other than generating direct profit.

One view of an organisation is that it is a "community of practice" providing goods and services to a broader "community" of consumers. This view applies equally to for-profit and not-for-profit organisations. There is one difference: A for-profit may measure its success within the community of consumers by the profit generated; A not-for-profit measures goods and service provided yet its income (funding for its operations) may come from non-consumer sources.

Thus a not-for-profit may operate within three separate communities: The organisation itself, the community receiving the goods and services, and the community providing the funding. These three communities each have different requirements. The goals of a Web site will vary depending on the target community.

Whichever community is being served, success of a Web site may be measured in terms of its support for the target community. This is not a commercial measure, rather it is a measure of the support provided for an existing community by the new Web site. The functions that already operate in the not-for-profit community may be supported and extended through the Web site. The Web site may develop and extend a community through online interaction.

## **CONCLUSIONS**

In order to evaluate the success or failure of a not-for-profit Web site, there must be measures related to realistic Web site objectives. It is difficult to develop objectives that clearly support the overall mission of the not-for-profit organisation. A number of approaches are based on combining financial with non-financial measures.

A not-for-profit works with more than one stakeholder community. Key stakeholder groups are: The people – often volunteers – who manage and operate the organisation, those who provide the funds, and those who benefit from the services. Developers of the Web site must be clear as to which community is supported by the site. Objectives of the Web site must support objectives of the community or communities that are supported.

An organisational Web site extends a physical community into a virtual community. In particular, the Web may be used to facilitate communication for community members who do not have the opportunity to meet at a common physical location. The new Web site needs to provide infrastructure and support for this new, virtual community.

This paper discusses issues with evaluation, stakeholders, physical and virtual communities. The paper is part of a broader research project. The overall project aims to improve the effectiveness of not-for-profit Web site development, beginning with the initial organisational decisions to adopt the new, Web technology.

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# How super is online Super?

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## ABSTRACT

*This paper examines an emerging example of the use of the Internet within the B2C relationship of superannuation funds and their members. The relationship is examined within the context of the increased responsibility that Australian employees are assuming in making decisions about their superannuation. The paper reviews the results of a survey of a sample of employees who were recently given a choice as to the form of their superannuation benefit and explores the demographic influence, which needs to be considered in such investment B2C relationships.*

*Keywords: B2C superannuation, online investment, investor choice*

## INTRODUCTION

Over 60 percent of Australian households have access to a computer at home and over 50 percent have access to the Internet at home (Australian Bureau of Statistics, 2000, p.3). This access level combined with the rapid rate of increase in Internet access and the much reduced marginal costs of use has made the Internet a viable means for business to communicate with their customers. The focus of this paper is one such potential relationship between superannuation funds and their members, and the funds use of the Internet as a means of communication.

At the same time as this means of communication has become available, Australian employees are being given greater responsibility in their superannuation decisions. The Superannuation Legislation (Choice of Super Funds) Bill 1998 will, if passed, force employers to offer choice to members about where their superannuation contributions are directed. A key component of the legislation, if it eventuates, will be the requirements for the provision of information by employers and the funds themselves. Even in the absence of compulsory legislation, choice is already being offered by many superannuation funds. The ability of these funds to provide relevant financial information will be critical in their success in attracting and retaining members.

Within finance investments theory financial assets have generally been examined through the dual lens of risk and return, within the context of the dominant utility maximisation framework. A wider consumer behaviour framework has only recently emerged, as a result of work by Thaler (1980) and others where the decision process of purchasing financial assets has been examined. Gallery et al. (2000) and Clark-Murphy and Gerrans (2001) have examined superannuation choices giving recognition to this wider view. The specific role of the Internet in purchasing financial assets is attracting increasing attention.

Given the importance of the superannuation decision to individual members, employers and to the government at a wider macro level, it is timely to examine the preference for receiving financial information via the Internet and any systematic differences amongst various demographic groups. This paper addresses this issue, by reporting on a survey of members of the Superannuation Scheme for Australian Universities (SSAU) who were given the choice to fundamentally change the type of account that they held and also the level of risk they were exposed to.

## **ROLE OF THE INTERNET IN THE INVESTMENTS INDUSTRY**

Financial markets have been leaders in the movement towards the use of the Internet as a medium for their business both at the business to business (B2B) level and at the business to consumer (B2C) level, Banking in particular. However the sophistication of the majority of transactions is not high. For example, the Commonwealth Bank which has the largest online banking offering estimates that of the more than half a million regular customers using online banking, more than two-thirds are only looking at an account balance (Johnston, 2001).

Online sharebroking has been a significant element in the growth of financial transactions on the Internet. Estimates of the size of online share transactions in Australia vary from 20 percent (Australian Securities and Investments Commission, 2001) to as much as 50 percent (Zanpetakis, 2001) distributed across over 30 brokers (Marshall, 2001).

Senator Richard Alston, the Australian Federal Government Communications Minister, has expressed optimism as to the potential of the Internet in assisting financial decision making in suggesting: Indeed the Internet has created what I'd like to call 'financial democracy'. Once upon a time the 'secrets' of the stock exchange were pretty well hogged by a small group of pin-striped brokers. However, in 1999 everybody can be on Wall Street.(Alston, 1999)

A review of several Australian surveys, however, does not support such an optimistic tone, in particular the notion of a 'financial democracy'. The Australian Securities and Investments Commission (ASIC), in reviewing its role as a 'catalyst for financial services consumer education' (Australian Securities and Investments Commission, 2000, p.4) suggested that 'it will not always be appropriate to rely heavily on the Internet for distribution'. They also suggest that other factors will slow the use of the Internet, specifically the low access rates to the Internet of some consumer groups (Australian Securities and Investments Commission, 2000).

ASIC's attitude has largely been informed by a survey conducted by the Consumer Affairs Division of Treasury (Consumer Affairs Division, 1997) and the previously referred to Australian Bureau of Statistics (2000) survey. The Consumer Affairs Division survey focussed specifically on rural and remote consumers. As ASIC suggests, the currency of the Treasury survey must be questionable given that, for example, access rates to the Internet have more than doubled for regional users and for households with income less than \$50 000 since the survey was conducted (Australian Bureau of Statistics, 2000, p.3). With this caveat in mind, the survey did however find a strong preference against using the Internet to obtain information and 72% of respondents said that they would not like to use the Internet at all.

The Australian Bureau of Statistics survey reveals that only a relatively small proportion (13 percent) of Australian adults use the Internet for what can be regarded as reasonably mundane transactions of payment of bills or transfer of funds. Of those shopping on the Internet more than two-thirds spent less than \$500 in the year (Australian Bureau of Statistics, 2000). Finally, whilst the 'secrets' of the stock exchange may no longer be the preserve of 'pin-striped brokers' it is far from being a participating democracy as there are large differences in Internet access, use and shopping by age, employment status, income and location categories.

Barber and Odean (2000) have explored differences between the performance of individual investors who moved from phone based transactions to online trading to invest in the U.S. stock market. They provide evidence that those who transfer to online investment, trade more frequently, assume a greater risk level and underperform the market. They attribute underperformance to overconfidence and the resulting tendency to trade too frequently. The overconfidence is attributed to the increased amount of information and data provided online and the immediacy of performance information. Similarly, Barber and Odean (2001) present evidence that contradicts the advertising message that trading online offers an advantage due to a quick response to changing circumstances. They find that online investors tend to trade too frequently and underperform due to this immediacy of response.

## **THE ROLE OF THE INTERNET IN SUPERANNUATION DECISION MAKING**

The advantages of B2B use of electronic commerce have been readily acknowledged by the superannuation industry. The Superannuation Industry Electronic Commerce Working Group was established in 1998 specifically for the development of electronic commerce industry standards for participating superannuation funds.

At the B2C level, there has also been significant adoption of the Internet in the delivery of information to superannuation fund members. Whilst ASIC is the regulator of information disclosure to superannuation members, there are no guidelines as to what can be provided on the Internet (Moore, 2000, p.50). A survey of a selection of the websites of major Australian superannuation funds revealed that only two of eleven features were common to all sites (Moore, 2000, p.50).

The type of advice required by fund members is an important determinant of the likelihood that the Internet can meet members' requirements. Employees are being offered choices that vary greatly in their implications. They are being asked to choose between fundamentally different types of benefit they are entitled to. They are being presented with alternative investment structures, which have different risk levels and therefore need to be considered in the light of many factors including the member's time to retirement, composition of household assets and income expectations in retirement. They are also being presented with the choice of competing funds offering different management teams and features that complete essentially the same task. For those who have considered the more involved planning issues, these may not present too high a degree of difficulty. However for those who have not and for those who are well into their working life such decisions may not be easy to make. For these individuals, it is likely that the requirement goes beyond a need for information alone and requires a more involved individual assessment. The question becomes one of how suitable the Internet is in providing the range of information and advice required?

The Australian surveys referred to previously related to general consumer goods rather than specific financial assets, or superannuation specifically. U.S. evidence suggests a preference for financial advice delivered face-to-face Hunter (2000) reports the results of two U.S. surveys which suggested that 'despite the availability of ever more sophisticated online services, a significant number of Americans still seek face-to-face advice when making decisions' (Hunter, 2000, p.8). Choi (2000) presented evidence, similar to Barber and Odean (2000; 2001), that workers with access to a web-based interface increase trading frequency compared with employees without access, in 401(k) plans, the superannuation equivalent vehicle in the U.S..

## THE USE OF THE INTERNET TO ASSIST SUPERANNUATION DECISIONS – SURVEY RESULTS

The increased superannuation choice that is being offered to Australian employees provides an opportunity to examine the specific role of the Internet in making superannuation decisions. Such an opportunity was presented when over members of the SSAU were presented with the choice of changing their superannuation benefit type. The members were surveyed to examine not only the decision that they made, but also what resources they had used in making the decision and what made the decision difficult for them. A discussion of the overall results with a focus on the investment choices made is presented in Clark-Murphy and Gerrans (2001). This paper focuses on the Internet usage by members through quantitative analysis of reported resource usage. Further qualitative analysis of the responses to open-ended questions regarding the difficulty of the decision will be explored in view of the potential role of the Internet in addressing these difficulties.

### QUANTITATIVE RESULTS

Members were asked which of the resources made available to them by Unisuper (the Trustee of SSAU), they had used and which resource they had relied upon the most in making their decision. The results are presented in Table One and Two respectively.

**Table One: Resources used by members**

	Frequency	Percent*
Information pack mailed to members	2105	87.8
Seminars run Unisuper on your campus	1128	47.0
Internet – Unisuper website	768	32.0
Modelling program available on website	591	24.6
Your local SSAU representative	272	11.3
No resources used	143	6.0
Other	59	2.5

\* multiple answers allowed, does not add to 100.

**Table Two: Order of which SSAU resources were most useful**

	Frequency	Percent
Information pack mailed to members	1388	58.7
Seminars run SSAU on your campus	488	20.6
Modelling program available on website	192	8.1
No resources used	127	5.4
Your local SSAU representative	83	3.5
Website	65	2.7
Other	23	1.0
Total	2366	100.0

The website contained a replication of the hardcopy material that was distributed to all members of Unisuper, as well as a limited modelling program which made projections of dollar returns to members based on investment strategy choice and the estimated time to retirement. Table One indicates that these two information sources were the third and fourth most used sources. However Table Two indicates that only eight percent of members considered the modelling program as the resource they relied upon the most and less than three percent the other website material.

To explore further the pattern of use of the Internet by members a logistic regression of website usage against a number of member demographics and reported characteristics was used. This includes either the website material or the modelling program. The demographics explored were gender, age and household income. The self reported characteristics included were the level of knowledge members considered themselves to have on superannuation issues, whether they considered the decision an important one and whether they considered the decision a difficult one. More formally the regression can be presented as

$$\log\left(\frac{\text{Probability(Website used)}}{\text{Probability(Website not used)}}\right) = B_0 + B_1\text{Female} + B_2\text{Age} + B_3\text{Income} + B_4\text{Importance} + B_5\text{Knowledge} + B_6\text{Difficulty}$$

Results are presented in Table Three with significant results, at the 95% confidence level, in bold. Each of the independent variables is categorical and hence the reported coefficient (B) indicates the direction and size of an increase in the log-odds of using the website given a category change in the explanatory variable.

**Table Three: Logistic Regression - Website Usage**

	B	S.E.	Wald	df	Sig.	Exp(B)
Level of knowledge: (base 'good')						
None	-1.045	.227	21.267	1	.000	.352
Little	-.720	.155	21.667	1	.000	.487
Average	-.199	.142	1.982	1	.159	.819
Important decision – yes	.877	.233	14.118	1	.000	2.403
Difficult decision – yes	.595	.103	33.538	1	.000	1.813
General Staff	.184	.109	2.868	1	.090	1.202
Age (base > 54yrs)						
18-34	.428	.176	5.908	1	.015	1.535
35-44	.309	.145	4.502	1	.034	1.361
45-54	.148	.140	1.106	1	.293	1.159
Household Income (base > \$120 000)						
<\$40 000	-.793	.210	14.272	1	.000	.453
\$40 000 - 60 000	-.251	.167	2.254	1	.133	.778
\$60 001 - 80 000	-.108	.161	.454	1	.500	.897
\$80 001 - 100 000	-.401	.167	5.763	1	.016	.670
\$100 001 -120 000	.065	.184	.124	1	.725	1.067
Gender - Female	-.247	.101	6.037	1	.014	.781
Constant	-1.268	.291	19.046	1	.000	.281

Number of cases =2097, 302 with missing values. Model -2 Log likelihood 2624.34.  
Nagelkerke R Square = 0.808. Hosmer and Lemeshow Test  $\chi^2$  2.037 df 8, sig. 0.980.

There are two categories for importance of decision, difficulty of decision and gender. For the first two of these the coefficients indicate if the member answered 'yes' and for gender if the member was female. The other coefficients have more than two categories and therefore indicate the direction and size of an increase in the log-odds of using the website given the particular response against the 'base' category as indicated in the table. The final column converts this to the change in the odds of choosing the IAA. For example using the estimates from Table Three, if the member was a female the log odds of using the website decrease by 0.247 and the odds of using the website are decreased by 21.9% (1 - 0.781).



Of the reported characteristics, if members assessed themselves to have a level of superannuation knowledge of 'none' or 'little', they were much less likely to use the website, than those who considered themselves to have a 'good' level of knowledge. If the member considered the decision important, the odds of using the website more than doubled and if the member considered the decision difficult, again the odds of using the website were significantly increased. Of the member demographics, females were significantly less likely than males to use the website, as were members with lower household income levels while younger members were significantly more likely to use it. In sum these results suggest that, to refer back to Senator Alston's remarks, if the Internet offers a "financial democracy" it is perhaps not a fully participative democracy.

## QUALITATIVE RESULTS

Accessing a resource alone does not necessarily indicate usefulness, which is perhaps a more relevant question. To address this question we now refer to the qualitative analysis of the open-ended question: 'What made the decision a difficult one?'. A total of 2098 individual comments were provided by 1410 respondents. To analyse these responses the Nud\*ist software package was used which allows the large number of 'unsystematised' responses to be coded into a system of nodes, or themes, that can be cross referenced with key demographics. As the questions are open-ended there are no preconceived nodes, rather they 'emerge' from the responses themselves. The final set of nodes are therefore the result of having analysed all responses and identifying similar responses and refining them into a manageable structure.

The responses were sorted into four main nodes. Three of these were labelled: uncertainty and risk, information and knowledge, the nature of the decision. The final node does not express a statement of type of difficulty but records the sort of attitudes and emotional experiences respondents stated as a consequence of their decision.

These responses were then viewed within a decision process framework, which can help identify where the respondents' difficulties arose on the time-line between when they were asked to make the decision and when the decision was made. This will help to identify whether the website was, and potentially is, a means of overcoming these difficulties. The coded responses were allocated to one of five stages in the decision process briefly outlined below.

### Stage One - Background knowledge and initial beliefs and attitudes (209 responses)

Initially the respondents have a certain amount of background knowledge and understanding of financial issues and superannuation. They have some sort of attitude towards retirement and the importance of saving for retirement.

### Stage Two - Respondents presented with choice (356 responses)

After being presented with the superannuation choice members needed to re-evaluate their initial understanding and attitudes. This assessment re-evaluation impacts on the amount of effort the member is prepared to spend on making the decision and the information search they will undertake.

### Stage Three - Information search (188 responses)

Difficulties in this information search stage include not knowing where to look, not knowing who or what to ask, or just having difficulty receiving the information sought. Some members may feel there is no information available that addresses their particular situation and some may find the information search too time-consuming and decide not to pursue it.

### Stage Four - Developing an understanding of the issues (369 responses)

The fourth stage is where members develop an understanding of, the issues based on the information obtained in the previous stage and background knowledge. The difficulties include failing to understand concepts due to complexity and terminology or lack of understanding of the implications of the choices.

### Stage Five - Making the choice (912 responses)

In this stage the respondents make the choice based on the level of understanding acquired in the previous stages. Difficulties arising during this stage relate to what qualities the member seeks in their superannuation. Influencing factors such as balancing and evaluating risk, preference for risk and security, employment status, uncertainty in terms of economic climate and political and legal changes.

## MAJOR SOURCE OF DIFFICULTIES - IMPLICATIONS FOR INTERNET USAGE

Most difficulty arose in stage five of the decision process, making the choice, followed by stage three, where the respondents develop an understanding of the issues, and stage two where the respondents develop an attitude towards the issues. Table Four presents the proportion of responses at every stage of the decision process.

**Table Four: Decision Stage Frequencies**

Stage	Percent
1: Knowledge level	10.1
2: Develop attitudes	17.7
3: Information search	9.0
4: Understanding	18.0
5: Choosing	45.0
	100.0

This suggests that the difficulty becomes larger the further members move down the decision process, and not surprisingly the stage in which most of the difficulty occurred is actually making the choice. It also suggests that the difficulty for the majority of members was not with accessing information, rather it was the processing and synthesising of the information to make a choice. The Unisuper website essentially only provided information, with a low-level interaction with the modelling program.

These results tend to support the findings reported earlier (Hunter, 2000; Reich-Hale, 2000) of a preference for using the Internet for information or data. As the major difficulties of members were not however information driven this may explain the relatively low usage of the website and the low indication that it was the most useful resource. It also supports the view that the choice was a more fundamental one for members, which required them, perhaps for the first time, to consider the complex issues associated with retirement. These were issues not able to be addressed by the website.

## **CONCLUSION**

Cost benefits and increased accessibility will continue the increased use of the Internet as a communication source between superannuation funds and their members. This paper has identified that being an information source alone will not lead to a fund's website being relied upon. Further, superannuation funds will need to consider the significant differences in access and usage of the Internet between their members, when seeking to communicate with them particularly in the current environment where the decisions being presented are of major importance and long term significance to their members.

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# Scoring goals: Strategic application of the Internet by Western Australian Sport Organisations

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## ABSTRACT

*The globalisation of communications has brought with it the ability to increase the efficiency of various aspects of running a sport organisation. This paper reports a preliminary study that investigated the role of strategy in determining Internet development for sport organisations. Using sport strategic types, 5 dimensions of strategy were identified and used as starting points for interviewing various organisational stakeholders in 2 Western Australian sports. The study found a number of themes that emerged which influenced the development of Internet strategies within sport organisations. These included strategic planning and sport development, financial aspects, the size of the client base, and sponsors and media influence. From these influences, additional research is required to further develop the necessary and requisite points to provide a model for optimal growth for the online sporting organisation.*

*Keywords: sport management, Internet, strategy*

## INTRODUCTION

The sport industry in Australia is a significant economic and social part of the nation's prosperity. Indeed, sport has often been described as permeating any number of levels of contemporary society, and it "touches upon and deeply influences such disparate elements as status, race relations, business like, automotive design, clothing styles, the concept of hero, [and] languages and ethical values" (McPherson & Curtis, 1989, p4).

The value of sport to Australia has been described in detail in terms of social and community benefits as well as economic contributions (Confederation of Australian Sport, 1998; Department of Industry, Science & Resources, 2001; Shaping Up, 1999).

Aspects include a sense of national pride, social cohesiveness, well-being and personal development as well as contributing to areas such as increased employment, greater productivity, increased exports, decreased crime and decreased health costs to the community.

With this increased interest in the role of sport to deliver a variety of outcomes in the community, the nature of strategic use of the Internet by sport organisations needs to be addressed. Academic interest in the area of sport and recreation has traditionally focussed on sport science research and sport pedagogy, and recently the emergence of business and sport as a new paradigm. Part of this includes the use of new technologies in sport and in particular the use of new communication channels to grow the business of sport through providing rich mediums to achieve this.

This paper reports on initial findings on the role of strategy in determining Internet development for sport organisations. The study forms part of a larger scale research project and it is within this context that it has been identified that there is a need for specific strategies to be developed and modelled that will allow sport organisations to grow and take advantage of the online opportunities available.

## **SPORT STRATEGY**

There are many different types of sport organisations, and the use of structure, design and context are elements that are used to describe aspects of these organisations (Slack, 1997). The main contextual factors, which determine the effectiveness of the organisation, are those of strategy, size, and the environment in which the organisation operates. These contextual factors influencing the organisational structure will play a part in shaping an online strategy of an organisation, as each factor is interdependent in determining the resources available for operations of the organisation (Daft, 1989), including online strategies.

The factor of strategy refers to the goals and objectives of a sport organisation, usually stated in a formal plan with a mission and stated outcomes that are measurable. Strategy has been described as a key component of organisational structure and is usually expressed at two levels, the corporate level, and the business or operational level. Slack (1997) notes that:

strategy formulation and implementation involves a series of steps, including formulating a mission statement, conducting an assessment of external threats/ opportunities and internal strengths/weaknesses, selecting the appropriate strategy, or strategies, and designing the necessary organisational structure and control and integration systems. (p110).

Daft (1989), suggests that strategy formulation is dependent on the size and scope of the organisation based on the corporate level strategies, such as acquisition of new business divestments and joint ventures, as well as business level strategy concerned with a single service or product line. However, Thibault, Slack and Hinings (1993) in formulating a framework for defining strategy within Canadian sport organisations suggested that there is no one best way to strategize in sport organizations:

the strategy developed should reflect the organizational situation. Hence different organizational situations will yield different strategies. (p25).

Thibault et al., (1993) points to the fact that differences may arise in applying principles as alluded to by Daft (1989) to sport organisations as the majority of research in the area has focussed on organisations whose primary goals are to make profits:

in essence, the context in which non profit [sport] groups operate is different from the context of profit oriented organisations. Thus non profit organizations do not necessarily strategize in the same manner as organisations whose goals are primarily profit oriented.

For example, in addition to securing dividends, profit oriented organizations may have as their objectives to increase their profit margins, to increase their market share, to be leaders in their competitive domains, or to capture new market segments.

These priorities may be problematic when one is studying strategy in non profit organizations, because the goals and objectives of these organizations usually focus on providing services and programs, not making profits. When non profit [sport] administrators develop strategies, their purposes are generally very different than those of profit oriented organisations. (p26).

Although strategy typologies in voluntary sport organisations may not fit within the general notion of strategy formulation (Daft, 1989; Thibault, et al., 1993) it is generally accepted that all sport organisations develop strategies that are either deliberate or emergent (Slack, 1997). Mintzberg (1978) described this as, "deliberate strategies [which] are intended courses of action that become realised. In contrast, emergent strategies are those that are realised but not necessarily intended".

Slack (1997) described the strategy-structure relationship within sport organisations thus:

strategy may then be planned and deliberate, it may emerge as a stream of significant decisions, or it may be some combination of both. In any of these situations organisational decision makers base their choice of strategy on their perceptions of the opportunities and threats in the environment, and the internal strengths and weaknesses of their organisation. Then, as a result of the strategy they choose, they institute an appropriate organizational structure. (p93).

## **A FRAMEWORK FOR STRATEGY IN SPORT**

There is a dearth of material on strategy formulation and implementation in sport organisations (Slack, 2001), The major work in the area of sport strategy is that of Thibault, Slack and Hinings (1993; 1994) who developed and empirically validated a framework for the study of strategy formulation in non-profit sport organisations.

In developing a framework for the analysis of strategy, Thibault et al., (1993) referred to the earlier work of MacMillan(1983) as well as Montanari and Bracker (1986) and Montanari, Morgan and Bracker (1990). However direct use of findings proved inconclusive and non transferable as the majority of works within the strategy literature related to profit focused organisations. These studies were used to provide insights into other types of organisations, such as sport organisations. From this, certain imperatives were identified by the researchers as those categories that organisations must consider when developing strategies (Robbins, 1990). As Thibault et al. (1993) note: strategic imperatives provide information about the context in which non profit [sport] organisations operate. It is important that this context be identified in order for administrators to develop appropriate strategies for their organisation. (p32).

The approach in this study was to investigate whether any of the strategic imperatives illustrated in Table 1.1 are reflected in the online strategies of sport organisations within a Western Australian context.

Table 1.1: Strategic imperatives for sport organisations  
(Adapted from Thibault et al., 1993)

Dimension	Imperative	Description
program attractiveness		strong program attractiveness is indicative of good networks of programs, new programs developed through existing networks.
	fundability	Ability to attract financial resources from external sources. The stability of any funding to the organisation.
	size of client base	The number of clients or members the organisation provides programs and services to.
	volunteer appeal	Ability of the organisation to attract human resources (volunteers); ie., coaches, officials, members of the board of directors, etc.
	support group appeal	The extent to which the program is visible, and appeals to external groups who are capable of providing support; ie., media, sponsors.
competitive position	Total costs	A strong competitive position is indicative of few costs for clients to participate.
	equipment costs	The costs associated with the equipment participants need to actively compete in the sport at an introductory level (the cost to the participant).
	affiliation fees	The costs associated for participants to access training facilities, coaching and competitions.

## METHODOLOGY

The participants involved in the study were from 2 sport organisations based in Western Australia with the following stakeholder categories: Chief Executive Officer of the organisation; a board member of the organisation; and a sponsor of the organisation. In total 6 people took part in the study. These stakeholder categories were chosen on the basis of being the categories that would contribute most to the development of online strategies within the sport organisation. The sport organisations were chosen to participate in the study on the basis of:

classified as non profit organisations under Australian legislation;  
being Western Australian state based;  
being funded on an annual intention by the Ministry of Sport and Recreation through the sport lottery fund as approved by the Minister for Sport (Ministry of Sport and Recreation, 2000);  
properly constituted or articles of association under the relevant Australian legislation;  
employing 1 or more persons to carry out the day to day operations of the organisation (Ministry of Sport and Recreation, 1996), and;  
having participant categories of Chief Executive Officer, Board of Management, sponsors, coaches and players (Ministry of Sport and Recreation, 1996).

Importantly, organisations were not included that utilised Kitchen Table operations to run the sport. The term "Kitchen Table" has been used previously (Kikulis, Slack & Hinings, 1992, 1995a, 1995b) to signify sport organisations where a central office location, paid staff, and strategic plans are absent and where a heavy reliance is placed on volunteers that hold a number of different roles. Such a structure has few hierarchical levels, is governed by few formal rules, and has little specialisation of volunteer roles or tasks (Kikulis, 2000).

Following the selection of participants, the data collection methods were chosen. This study adopted a qualitative approach using interviews to explore a number of questions based on Patton's (1990) interview guide approach. The flexibility in the interview guide approach allowed the sequencing of questions and decisions on whether to pursue some lines of questioning that emerged during the interview process. The interview guide was based on the strategic imperatives of Thibault et al., (1993, 1994) sport types described previously.

The interview guide questions were subsequently developed using the sport strategy imperatives of; fundability; size of client base; volunteer appeal; support group appeal, and; total costs (equipment costs and affiliation fees) as a starting point for the interviews.

Following the interviews, transcripts were produced and coded into NUDIST, a qualitative software program designed to assist in identifying nodes for analysis and identification of common occurring themes throughout the data. The responses in the nodes were then grouped to identify themes and to connect ideas and assemble theories about the data. These themes were then concentrated to create a thick description of what occurred and to formulate some further areas of exploration for the research.



## DISCUSSION

A number of categories of activity (the themes) were identified which corresponded to the 5 strategic imperatives on which the interview guide was based as well as other nodes which became apparent on analysis of the data. The study found a number of themes that emerged which influenced the development of Internet strategies within sport organisations.

These themes were; strategic planning and sport development; financial aspects; the size of the client base, and; sponsors and media influence. The themes of activity are presented with a discussion on the type of activity that influences Internet development, and substantiated with an example from participants in the study where appropriate. Participants are identified by their first initial in the interview quotes.

### Strategic planning

Strategy is one of the key components in the success of any organisation (Mintzberg, 1987) including sport organisations (Slack, 1997). Thibault, Slack and Hinings (1993, p25) have suggested "in order to anticipate changes and challenges in their environments, sport organisations must formulate strategies". Several authors (Bryson, 1988, Schendel & Hofer, 1979; MacMillan, 1983) purport that non profit organisations do not strategise well, as their focus is on their day to operations and immediate survival, rather than focusing on long term initiatives.

This study identified two major themes, that of a deliberate strategy where sport organisations formally planned for Internet development, and emergent strategies, where the strategy grew from necessity rather than planning.

Of note was the relative dominance of an emergent strategy, coupled with a general indifference towards any planning process from all participants. Although sports were aware of the need to formally plan and strategise, it didn't occur as such:

there's probably a strategy. There's the strategy pushed by a half a dozen very determined people in the IT committee that this is the direction [the sport goes] (interview with S).

And further:

there's probably a plan by default through the committee but it comes back to 'what mother thinks best for her kids'. What the committee thinks is good for the movement is what the movement is getting. Whereas we haven't gone to the membership and asked what they want and formalised anything (interview with P).

there's no internet strategy, I think what's happened is by good luck more than good management...because, I don't think we have the vision...and I think it's been a two or three year process coupled with the fact that so many people now have access to the Internet the way they do...I guess I relate that to myself who three or four years ago didn't even know how to access the Internet (interview with J).

Importantly, although the planning may have been on an emergent basis, it was recognised that it is a vital component:

all sporting organisations or most sporting, probably not all, all have our strategic plans. Some areas work extremely well and other areas badly. And I guess within the strategic planning the IT doesn't work well at the moment. (interview with J).

The role of sport development and the means by which the Internet could assist was also mentioned by all participants in the study:

by detailing what's on offer so things like coaching courses, when they are running, why should you do them, how much do they cost - people actually look at it and roam around the site, they will find things like that, information they wouldn't necessarily know about. (interview with K).

I think it's critical that we use the Internet because of the way it's been taken up and subscribed to and so many people are using the Internet as the first point of information to find things. (interview with P).

We have a well structured web-site...whilst it has some problems ...it is very valued part of the membership. (interview with R).

Metrics were also mentioned within the context of sport development, certainly in measuring the success or otherwise of the Internet in growing the sport organisation as well as measuring the effective of the Internet in delivering the sponsors messages or marketing information. Few participants quantified any metrics for their web sites, stating that they "have never stopped to think about it is to be honest" (interview with S) as well as:

we don't know if the website is effective but it seems to be. There's a little bit of hearsay evidence and that's the only evidence we've got would indicate the members are happy with it (Interview with K).

Although some did perceive a need to use the Internet to leverage how strategies could be developed:

we should be putting out a...survey to our membership...so we find out what they want and not what they are pushed into agreeing to. Whereas at the moment there are some strong personalities driving the website, what they want they get. (Interview with R).

### **Financial aspects**

Non profit sport organisations rely on external funding from government and other sources as the primary means of financial support to the organisation. In this study, 2 imperatives, that of the fundability of the organisation, as well as the total costs of playing the sport were considered. The fundability refers to the ability of the sport to "attract financial resources from external sources" (Thibault, et al., 1993, p33), whilst the total cost includes equipment costs for the individual to be involved in the sport, as well as any affiliation fees involved such as membership costs, access to training facilities, coaching and competitions.

Thibault, et al., (1993, p33) suggests the fundability imperative is quite important, as access to financial resources is directly linked to the "development and implementation of programs and to the provision of services". The participants in this study all recognised the relevance of the financial cost, and saw the lack of money as a failing in being able to develop online strategies:

Internet development is ranked a fair way down the list...the majority of our spending goes on competitions and coaching, so the IT would be down the list. (interview with D).

And:

There is never enough money...devoted to the website . (interview with K).

However, the Internet was also seen as a way to reduce costs to members, conversely saving money for the organisation:

It's [internet development] allowing us to lower our costs on some of the other areas that we have traditionally spent money on. Mail is a real problem, particularly off-season because it doesn't get opened...and to ask a club to pass something on they are not going to want to photocopy 350 of them because there's a cost in that whereas the cost in emailing it is next to nothing. (interview with S).

As well as funding, the total costs involved in the sport were also an issue however some participants didn't perceive any use of the Internet to keep members costs of participation low and suggested that the sport could provide extra opportunities using the Internet that could be used to overcome barriers to entry into the sport by "easy access to information that aren't of a high cost" (interview with D), or "by having an information area on the web site where they can find [information], they can have a range of options as to where they can purchase equipment" (interview with R).

### **Size of client base**

The number of members is the major factor which influences the size of the client base in sport organisations, and has been previously described as the number of people the organisation caters for in delivering its programs and competitions (MacMillian, 1983). Various authors (Thibault, et al.,1993; Thibault, et al.,1994; Ministry of Sport & Recreation, 1996) have suggested that the size of the membership of sport organisations is a good indicator of the number and type of sport programs they offer.

In this study, the size of the client base was not seen as an issue, as participants perceived the Internet as breaking down barriers of communication, and getting more members aware of the Internet:

our main initial drive should continue at the moment being to get people aware of the Internet...getting more people on to our e-news...putting broad policy or broad initiatives out to the membership and perhaps having discussion groups where we can throw a few topics out for discussion but the big thing in doing that is that you have to have a bit of a plan about what you're going to do. (Interview with S).

Importantly, it was not only the size of the client base, but the distribution of the client base that mattered. The client base of the two sport organisations in this study are spread over a large region within the state of Western Australia, an area the size of Europe, and the Internet assisted in reducing geographical isolation in communicating with the client base:

it's not only the number of people but it's the distribution of people because we are really state wide, so the communication process is vital, you would never do a mail out to individual people whereas you can develop Internet lists that can help do that. (Interview with R).

With regional isolation comes the issue of financial constraints as discussed earlier. The Internet was seen to assist greatly in easing the financial impact in delivering information to the vastly segmented client base:

we have only got 20 clubs throughout the state, but we sent out a newsletter to them. We asked them to reply with an email address if they preferred to receive it electronically and I think it was something like 80 percent said yes send it electronically. So there's a direct saving on that but also you've got the instantaneous receipt of the fact that they have actually received it, and it doesn't take all week to get there. (interview with K).

### **Sponsors and media influence**

Sponsors and media go hand in hand in providing a vehicle for sport organisations to raise revenue, and the profile of the sport and individual teams and members alike. Sport organisations have quickly grasped the relevance of the Internet as providing an additional means of communicating sponsors messages to a wide and varied audience:

we can support our sponsors by having direct links back to their [web] pages and some of those could have opportunities to purchase things on line. It can also tie into distribution and allows them to develop their own database and new membership without actually giving it to them. (Interview with J).

Similarly, the sponsors of sport organisations also monitor the sports using the web:

our sponsors look at the web quite often...there is on-going monitoring of both content and the sighting of sponsors messages. (Interview with P).

Thibault et al., (1993, p34) have suggested that media visibility of a sport can be an indicator of the sport's popularity, and that "the frequency at which information about the sport appears in the media may promote the sport to potential members, enticing individuals to join a club/team in order to practice the activity". The Internet is used regularly by the media for sport results:

the people in the media quite often go on the website and download these results. That's then followed up with or initiated by personal approaches from us in the first place. (Interview with D).

Additionally, the ability of the Internet to allow publishing of results by sport organisations without utilising traditional mass media and go direct to members has proven successful:

being able to get results off the Net is really important because people want to know what is happening. We are not getting the exposure in the media that football enjoys or whatever. (Interview with J).

## CONCLUSION

It is clear that the Web, particularly in its communication functions, provides unique opportunities for sport organisations to help build successful programmes (Beech, Chadwick, & Tapp, 2000; Pope & Forrest, 1997). Certainly, the Australian Sports Commission, as well as the Confederation of Australian Sport (CAS) realise that the importance of strategic planning is of utmost priority for any sport organisations continued success and the continued growth of Australian sport (Shaping Up, 1999, CAS report, 1998a; 1998b). Indeed the CAS report (1998a) characterises a future where:

the traditional sporting structure will develop a more strategic approach to decision making, marketing and sports development clearly focusing in outcomes. This will better secure investment funds from both the government and private sectors and allow a more successful delivery of sporting programs at state and community level. The net effect will be an increase in productivity in the sport sector. (p14).

The initial findings of this study contribute to the investigation of determining how sport organisations strategise. The study found 4 major themes that emerged which influenced the development of Internet strategies within sport organisations.

These themes of strategic planning and sport development, financial aspects, the size of the client base, and sponsors and media influence, provide an initial point to further develop the online sport organisation. Further exploration and study in this area is needed to determine how, and whether strategy is emergent or planned and how specific strategic imperatives may relate to the development of rich online communities for sport organisations.

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# Examining the Outsourcing Decision - A Structure/ Agency Perspective

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## ABSTRACT

*Organisations adopt outsourcing for a number of different reasons. It is useful to examine the process by which organisations make such decisions and the impacting influences on the decision. The paper initially presents a perspective based around diffusion theory and argues that such theory ignores the impact of wider high level macro influences. A model is then developed incorporating such wider macro level influences to help explain why organisations make the decisions they do. It suggests that the 'outsourcing bandwagon' can be considered as derivable from external social 'structures' which impact internal agency decision. The paper finally develops a framework for categorising the major impacts on the decision process.*

*Keywords: Outsourcing, Diffusion Theory, Structure and Agency*

## INTRODUCTION

Organisations adopt an outsourcing approach for a number of different reasons. It is interesting to examine the process by which organisations make such decisions and the impacting influences on that decision. Newell, S., Swan J. A. and Galliers, R. D. (2000) address this issue by examining the diffusion of BPR within a particular organisation. The article bases their examination on diffusion theory with BPR considered as innovative practice. Innovation diffusion is defined as 'a socially constructed process involving the development and implementation of new ideas' (Van de Ven, 1986).

In a similar fashion to Newell et al (2000), Kautz and Larsen (2000) examine the diffusion of software best practices and again see the diffusion process as a communication processes leaning on the original diffusion theory of Rogers (1983). Rogers sees the diffusion as 'the process by which an innovation is communicated through certain communication channels over time among the members of a social system and an innovation is an idea, object or practice which is perceived as new by an individual or another unit of adoption. In other words the diffusion process largely is a communication process or, as Rogers puts it, an information seeking and processing activity.' (Kautz and Larsen, 2000, p. 12).

Rogers (1983) examines the process of innovation diffusion from a communication perspective. Such an examination highlights the social aspects of the adoption and diffusion process and basically sees the technological diffusion as a social communication process rather than purely a technological implementation.

Newell et al (2000) build on this model to examine the reasons for the widespread and rapid diffusion of BPR and also suggest that their research can also be applied to similar technological fashions such as TQM, outsourcing, ERP and CRM. They present a knowledge focussed argument to understand the diffusion of such complex technologies; in particular they highlight the ways in which the knowledge underpinning a new technology is packaged and bundled by the supply side organizations in order to encourage its more rapid and widespread diffusion. These supply side firms such as associated technology suppliers, management consultancy firms and professional associations are seen to bundle the technological practices in a manner that is considered by the authors to be overly simplistic - the simplicity of the bundling blinding the prospective users to the inherent underlying complexities.

Such a perspective on outsourcing would see outsourcing in a negative light as primarily reflecting management 'fashion'. In line with this argument Lacity and Hirschheim (1993) also see that a major part of the outsourcing trend reflects a 'bandwagon' effect resultant from an unrealistic expectation of success prompted by highly publicised successes such as that of Kodak (Loh and Venkatraman 1992). They present some of the myths associated with popular outsourcing claims and suggest that the complexity of the process belies the seeming simplicity of the underlying concepts and promotional literature.

Both Newell et al (2000) and Lacity and Hirschheim (1993) present a negative perspective on technology diffusion - Newell et al suggesting that the deliberate and simplistic bundling of technologies by supply side firms hides real complexities, whilst Lacity and Hirschheim (1993) arguing that false user side perceptions encourage the adoption of ultimately technically inefficient outsourcing practices. Both perspectives depend heavily on interpretive theory - they see the diffusion and adoption process as a social process fundamentally depending on user perceptions of the practice. This interpretive approach can be contrasted with that of the realist who would argue that such organisational decision making is not purely dependent on individual perceptions but is also a consequence of external structures - 'real entities with their own powers, tendencies and potentials' (Archer 1995, p. 106). These external structures impact individual decisions in significant and measurable ways. A realist examination depends heavily on consideration of the role that social structures play in the organisational situation and how those external structures impact agency decision.

## **A STRUCTURE/AGENCY PERSPECTIVE ON OUTSOURCING**

Bypassing the important issue as to whether outsourcing is a technically efficient innovation it is interesting to consider how the authors of both articles see the role of organisational managers and external/internal structures in the diffusion process. Newell et al (2000) recognise the importance in the diffusion process of external social structures such as management consulting firms, technology suppliers, professional associations, educational institutions, associated partner firms and government bodies but downplay the decision making role of internal organisational managers by suggesting that they will passively accept the false packaging of BPR technologies and routinely accept innovative technologies - even, perhaps, inefficient technologies.

Similarly Lacity and Hirschheim (1993) downgrade the decision making role of organisational members by arguing that the outsourcing movement can be seen as an irrational 'bandwagon' of firms overly influenced by the myths of outsourcing. Yet such views can be seen to be overly simplistic - the simplistic conclusions ignore the particularity of organisational situations. The outsourcing decision is often not a direct result of fashion following but may well reflect other important social structures. The acknowledgement of such wider impacting social structures will also tend to divert the blame for bad outsourcing decisions from the individuals concerned, as it should be. Managers operate in complex decision environments and often react to situations and pressures that are not directly observable. A process focussed study that ignores the potential impact of such wider impacting macro level 'structures' is only telling half the story as Reed (1997 p. 25) points out in a critique of traditional post-modern approaches:

The ontological status and explanatory power of 'structure' - i.e., as a concept referring to relatively enduring institutionalised relationships between social positions and practices located at different levels of analysis that constrain actors 'capacities to 'make a difference' - is completely lost in a myopic analytical focus on situated social interaction ...

He suggests the adoption of a stance that acknowledges the importance of both structure and agency and thus avoids the problem of dealing with 'flat' or 'horizontal' social ontologies in which the processual character of social reality totally occupies the analytical and explanatory space available' (p. 24).



## NEGATIVE PERSPECTIVES ON OUTSOURCING

Abrahamson (1991) presents a sceptical view on innovation diffusion based around the question 'When and by what process are technically inefficient innovations diffused or efficient innovations rejected?' (p. 587). He argues that much of the business literature demonstrates a pro-innovation bias in its implied assumption that all innovation is good. This pro-innovation bias is demonstrated through an often implied assumption that adoption of innovation is important (e.g. critical success factors for successful adoption, factors that affect early adoption, factors that affect innovation diffusion etc).

Using this sceptical perspective on the diffusion process he develops a model to help describe the ways in which technologically efficient processes may be rejected or technologically inefficient processes diffused and accepted. To reflect potential adverse forces at work on the decision to accept innovative technologies he presents two new dimensions to explain undesirable outcomes - the impact of outside 'influences' and the imitation element in organisational decision-making (see Figure 1). The model is based on Rogers (1983) diffusion theory and thus represents the diffusion process as a communication process. Rogers (1983) defines 5 stages in the decision making process:

- (1) Knowledge is the stage where a potential adopter learns about the existence of an innovation and gains some understanding of its way of functioning.
- (2) Persuasion is the stage where a favourable or unfavourable attitude towards an innovation is formed.
- (3) Decision is the stage where activities are undertaken which lead to the adoption or rejection of an innovation.
- (4) Implementation is the stage where an innovation is actually put to use.
- (5) Confirmation is the stage of reinforcement for an adoption decision which has already been taken. (as quoted in As Kautz and Larsen (2000, p. 11).

Rogers (1983) also defines a number of different communication 'channels' that are involved in the knowledge dissemination process. The mass-media channels (such as the Internet, newspapers and radio/television) are distinguished from the interpersonal channels reflected in face-to-face exchange in an informal setting. Cosmolite channels which involve access to sources outside their own social system are also distinguished from localite channels which provide information from inside sources. Each of the various channels are considered to have a greater or lesser degree of importance depending on the stage of knowledge diffusion.

Clearly Rogers (1983) model is a process model that concentrates on the process of decision-making and does not give high-level macro influences a major role in the analysis process. From a realist perspective the communication 'channels' can be used to highlight potential impacting structures and thus give the analysis a more complete focus.

Perhaps Abrahamson (1991) can be seen to provide an implicit recognition of the importance of macro-level structure by the inclusion of internal and external 'influences' in his model - thus suggesting that a completely process focused approach would not be sufficient to explain the diffusion process. Amending his model to explicate the underlying assumptions regarding structure and agency provides some useful insights.

		Imitation-Focus Dimension	
		Imitation Processes do not impel the diffusion or rejection	Imitation Processes impel the diffusion or rejection
Outside Influence Dimension	Organisations within a group determine the diffusion and rejection within this group	Efficient-Choice Perspective	Fad Perspective
	Organisations outside a group determine the diffusion and rejection within this group	Forced-Selection Perspective	Fashion Perspective

**Figure 1: Theoretical perspectives to explain the diffusion of technologies**  
(Abrahamson (1991, p. 591))

The first perspective - the efficient-choice perspective - assumes that technology adopters make independent, rational choices guided by organisationally measurable goals of technical efficiency - it assumes that organizations are relatively certain about their goals and their assessments of how efficient technologies will be in attaining those goals. This perspective elevates the role of the agent and minimises the role of impacting structures. It emphasises the rationality and power of the 'doing' agent by suggesting that it is the agent's sole choice to accept or reject the technology. This perspective does, however, ignore the potential for outside structures to impact the acceptance of the innovative technology.

The second perspective - the fad perspective - sees organizations as operating in conditions of uncertainty about organisational goals and imitating other organizations by adopting new technologies ('fads'). As Abrahamson (1991) argues this adoption can be for a number of reasons such as:

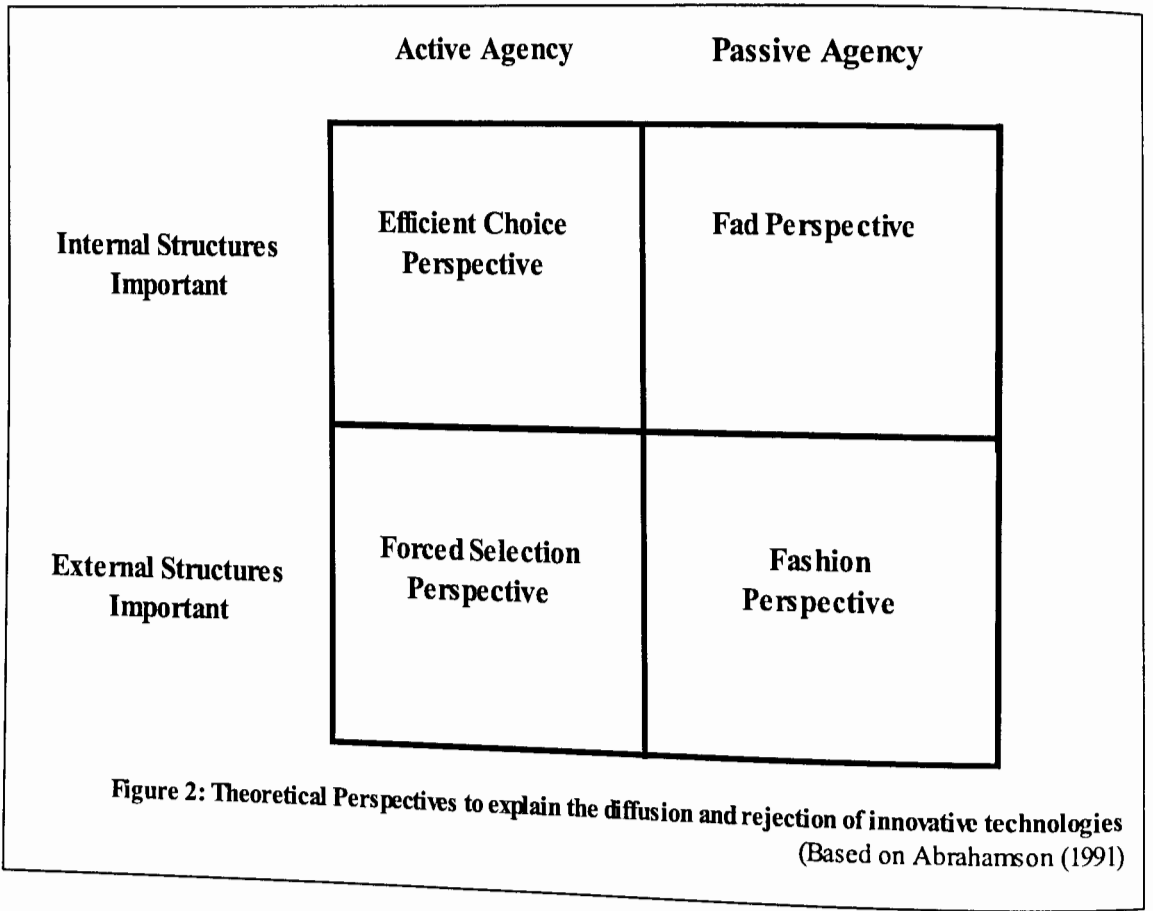
- a) knowledge dissemination from the 'fad adopted' organization allows them to feel safe in adopting the new fad
- b) a desire for the legitimacy provided by following the emergent norm
- c) a desire to avoid the adopting organization achieving a strategic advantage through early adoption

The fad perspective encourages considerations as to agency **and** structure, emphasising the role of the active agent in the decision to adopt an unproven fad, but suggesting that only internal structures (such as associations with the fad adopting firm) impact agent's decision, external structures being neglected.

Along with the fad perspective, the fashion perspective assumes a high degree of uncertainty about organisational goals and sees organizations as primarily imitating other organizations external to the business area (such as management consulting firms) rather than making rational independent decision. This perspective relegates the role of the agent in that it argues that the organisational role of fashion follower will predominate over individual actor decision.

The final perspective presented is the forced selection perspective. According to this perspective organizations outside the adopting organization may use their power to affect the diffusion of innovations; rational decision-making is present but ignored as powerful external influences predominate.

The vertical axis of Abrahamson's model (Figure 1) suggests that internal and external 'influences' are most important in the examination of innovation diffusion - such influences can be seen to result from internal and external social structures. The horizontal axis suggests that agency decisions are less important in some situations (where imitation pre-dominates). Modifying Abrahamson's model slightly makes this agency/structure perspective explicit (see Figure 2) and allows one to view the role of impacting social structures on organisational decision-making. The new model makes explicit Abrahamson's assumptions regarding agency and structure and is basically in line with the Reed (1997) who argues that both structure and agency must be considered in the social analysis of organisational situations. The model will now be used to provide a basis for examining the structural impacts on the decision to outsource in the governmental case under study.



## THE EVENTS LEADING UP TO OUTSOURCING

The case study referred to involved a longitudinal study of a large public organization over a period of five years and coincided with the outsourcing of the IT division. A number of senior IT staff as well as the Business Planning Manager were interviewed individually on several occasions, and staff were interviewed both pre and post outsourcing. The case study draws upon organisational reports and documents in addition to the interview transcripts. The interview transcripts have been analysed for key themes and the quotes used are representative of these.

The organization was traditionally an engineering organization being heavily involved in capital works development. Prior to the decision to outsource the organization saw the IT department as providing a service function:

The organisation in those days saw IT as a necessary evil. They were focused on one of two things, engineering or financial considerations and IT was something they had to have, but they didn't really want to spend any money on it and all the money they had spent, was too much - 'where was the return on the investment?' - that was the continual question. (IT Manager).

The IT Manager at the time was intent on improving the status and recognition for IT - he had worked hard towards achieving this recognition and had reached agreement that for planning purposes the Information Business should be treated at the same level as the other major business areas - money, assets and people. The development of the first Information Business Plan was a major achievement in an engineering focussed organization. Yet there was a degree of opposition to this idea as an employee later points out:

The prevailing view of executives at the time was that it was completely inappropriate to describe the information thing as a business. That caused quite a bit of grief and controversy - it is merely a process. No way is it a core business, it is just a support process or function.

In order to properly complete the Information Business Plan there was a need to examine the information requirements of the various business processes - the IT Manager lead this modelling exercise. Over the period 1993-1995 the IT Manager developed the Information Business Plan and continued work on process modelling and investigations into outsourcing of non-core processes:

On the practical side of delivering a service we were starting to shine, we were winning TQM awards, the quality of our service was very good, and we were getting accolades in the press, the cost of our service was benchmarked internationally in the top six in the world. So things were going very, very well. (IT Manager).

This seemingly efficient operation did not stop the move towards the outsourcing of the entire IT operation:

The rationale I understand was that the Organisation was running one of the best IT shops and also was one of the biggest and therefore the most expensive. [The argument was that] 'If we can successfully outsource the Organisation's IT services and beat a lot of those battles then the other ones won't have a leg to stand on'. Now that's why it moved quickly, basically from the moment the decision to look at outsourcing seriously was announced everything stopped on the information business planning (IT Manager)

The modelling work was stopped as the uncertainty engendered by decisions regarding outsourcing hampered the modelling process:

We didn't do anything more [on process modelling] and subsequently the outsourcing of many, many other areas of the organisation were announced and everybody stopped modelling because you can only do this sort of work where there's a harmonious attitude, people must want to do it and they need to see the benefits of doing it, as soon as you put this sort of turmoil and distrust and stress on people - how long do I have a job or where am I going to go to next? what's the organisation done to me? These sorts of things just don't work. You can't do it [process modelling] in this sort of environment and so the whole thing disappears (IT Manager).

The move towards outsourcing was a result of worldwide governmental trends towards smaller government and the need to privatise or outsource non-core functions. Much of the initial focus for the move was contained in the commonly called McCarrey Report - a report following from an independent commission set up to review state government finances. A part of their recommendation was that commercial activities undertaken by departments should be assumed by 'semi-autonomous business units within their parent agency' (McCarrey, 1993: 23).

As detailed in a discussion document prepared for public review in April 1995 (Commission on Government 1995), the Western Australian Government signed intergovernmental agreements to introduce a National Competition Policy. This policy was based on the reforms recommended by the National Competition Policy Review Committee (1993, The Hilmer Committee) to enhance competition in the delivery of public services. These two reports - The McCarrey Report and the Hilmer Committee report were important in defining the movement towards smaller government. The reports embodied the idea that the core business of government was ultimately to facilitate and to regulate - the provision of non 'social-justice' services being better fulfilled by private bodies. In 1993 the McCarrey Report suggested that the corporatisation reform process had commenced but was proceeding slowly.

Over the period 1993 to 1995 the IT Manager felt that he had a good relationship with the Managing Director (MD) at the time and he saw the MD as a supporter of information services:

He [the MD] had a very good understanding of business process reengineering and championed it - he had a good understanding of the concepts we were putting together, of managing by information, he created the term 'management through information' within the organisation. He actually championed it, which was fantastic for me. He was not overtly an IT supporter, though he knew where I was coming from and he could see where we were going... (IT Manager).

Unfortunately for the IT Department the MD was replaced in 1995 - the general consensus for the change being that the pace of privatisation reforms were not moving fast enough.

The new MD was less supportive of IT and the IT Manager commented that in the year between the appointment of the new MD and the IT Manager's departure they had only one meeting - *'He never came to IT ever'*. The outsourcing process proceeded quickly.

In the view of the pre-outsourcing IT Manager much of the outsourcing was not based on economic rationale:

[the MD] would've fought tooth and nail to continue the business process reengineering to improve the organisation not just for the sake of outsourcing. It cost [him] his job, he didn't move fast enough ... the agenda was 'to outsource, period' - not to outsource only if it made sense. There were many areas and IT was one of them, where [the MD] said this doesn't make sense, it's not a logical decision and a board of a private company would not do this. This support virtually cost him his position (IT Manager).

## CONCLUSION

For the above case study it can be argued that much of the day-to-day interaction and decision-making was determined by forces outside the control of the participating personnel. Using Abrahamson's framework for examining innovation diffusion the forced selection perspective is most useful in explaining the move towards outsourcing; governmental imposition was the primary cause of the move to outsourcing the IT Department.

A postmodernist situationally focussed examination of the situation would have difficulty in understanding why outsourcing eventuated. Only by considering the governmental influence can one properly explain the demise of an IT Manager and his department even when the IT manager had agreement to their first information plan and appeared to have a supportive champion in the then managing director. A consideration of imposing structures is essential to understand the outsourcing outcome, such structures being identified through the answering of such questions as 'What conditions make it possible for an efficient IT Department to be outsourced?'. The answer to this question leads to a consideration of deep, real non-perceivable structures, such as governmental associations, that are only observable through their effects. As Thong et al (2000) identify one of the most important differences between private sector and public sector organizations is the greater role of higher political influence in governmental organizations; the importance of this external structure is clear in the above example. It is clear that governmental 'forced selection' towards outsourcing was critical.

Whilst the impact of the fad or fashion element is difficult to quantify this element can be seen to have played an important role also. The organisation depended heavily on consultants to provide guidance and professional advice throughout the change process, such advice generally supportive of outsourcing.

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# Evaluating the Benefits of Electronic Marketplaces

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## ABSTRACT

*Electronic marketplace benefits were identified from the business press. The evaluation of these benefits was considered within a framework of existing IS benefits evaluation tools. It was found that while the e-marketplace benefits mapped onto the models described, these models were insufficient tools for the full evaluation of the benefits which it is anticipated will be available in maturing e-marketplaces. Further aspects to be included in empirical evaluations of e-marketplaces are suggested.*

*Keywords: Electronic commerce, Electronic marketplaces, Evaluation of Benefits*

## INTRODUCTION

The development of the Internet and Internet-based trading methods has led to a transformation in the way that companies perform. One of the most frequently reported areas of activity is in business-to-business electronic commerce where turnover is anticipated to reach \$1.3 trillion by 2002 (Afuah & Tucci, 2001, p34). To facilitate the buying and selling of goods and services in a rapidly expanding environment, B2B electronic hubs (or e-marketplaces) have been developed, initially by intermediaries and more recently by industry consortia. Like many other facets of e-commerce, the development and rate of growth of e-marketplaces has been significant.

There is an argument that the speed of development does not allow for old style strategy planning, which takes time to develop, execute and evaluate, but requires a constant rethinking of business development to respond to new technologies, based on the premise that technology is the 'essential enabler of change' (Downes & Mui, 1998). In contrast, Porter (2001) argues that the Internet, and its trading methods, needs to be integrated into an overall strategy and tailored to individual company needs if its benefits are to be captured as profit. Either way, companies have to address the question of whether to participate in the new technologies such as electronic marketplaces and, if they move in this direction, they need to assess what benefits they can and will gain from their participation. The growth of e-marketplaces, both in number and size, and the increasing participation of companies has received high profile coverage in the business and financial press and this has led to greater pressure on companies to consider participation (Banham, 2000). Forecasts of the savings and benefits for both suppliers and buyers are repeatedly quoted and predictions of wide scale changes in business methods, driven by the technology, are now the norm (Downes & Mui, 1998). These forecasts have yet to be translated into empirical evidence which would enable companies to make informed decisions on the benefits they could seek and realistically gain.



## ELECTRONIC MARKETPLACES

The number of electronic marketplaces currently trading on the Internet is estimated to be between 800 to 1000 (Hurwitz, 2000). They cover every type of good and service and vary in size, content, structure and organisation. The rapid increase in the number of e-marketplaces is expected to end with a period of stringent consolidation resulting in less than 200 marketplaces remaining within the next two to three years (Forrester Research, 2000). In the current climate of proliferation there are few barriers to entry and membership of multiple marketplaces is still common as companies seek to find the most appropriate platform for their needs. Choosing an exchange can be 'as simple as selecting where to order lunch or as complex as selecting a spouse' (Morgenthal, 2001) depending on the level of service a company is seeking. To benefit from the complete array of services offered, a company will require specific software and integration with legacy systems. This will lead to a greater commitment to selected marketplaces and require confidence that those marketplaces can survive the consolidation period and provide the anticipated benefits.

Electronic marketplaces offer three levels of service (Choudhury et al., 1998):

Level of Service	Services offered
Identification	Identification of possible buyers/suppliers to facilitate a choice and enable the transaction to take place. Particularly useful for goods and services that are difficult to source or where speed is a vital element.
Selection	Identification of possible buyers/suppliers and selection of the most appropriate one. Includes the use of auctions which are often used to source direct materials
Execution	Once selection has been made, financial and logistical services are available to complete execution of the transaction. This type of marketplace often offers further value-add services including industry information, design collaboration etc..

**Table 1: Levels of service offered by e-marketplaces**

Companies are moving towards electronic marketplaces in a piecemeal way. Some are trying multiple membership, while others are locked into one marketplace either through choice or to follow the direction of a major supplier/buyer. If these marketplaces are to flourish and bring real benefits to industry they need to attract and maintain a critical mass of participants. This requires a clearer knowledge of the prospective benefits and how to acquire them on the part of buyers and suppliers. There is extensive anecdotal reporting of the benefits in the business press, but it is difficult for companies to be sure of the source and validity of these reports.

In this confusing environment there is a need for a systematic look at how the electronic marketplaces can contribute real value to a company. An evaluation of benefits which is grounded in Information Systems theory and then mapped against the benefits espoused by the business press would give an impartial, but practical starting point on which companies could begin plans to maximise the use of electronic marketplaces.

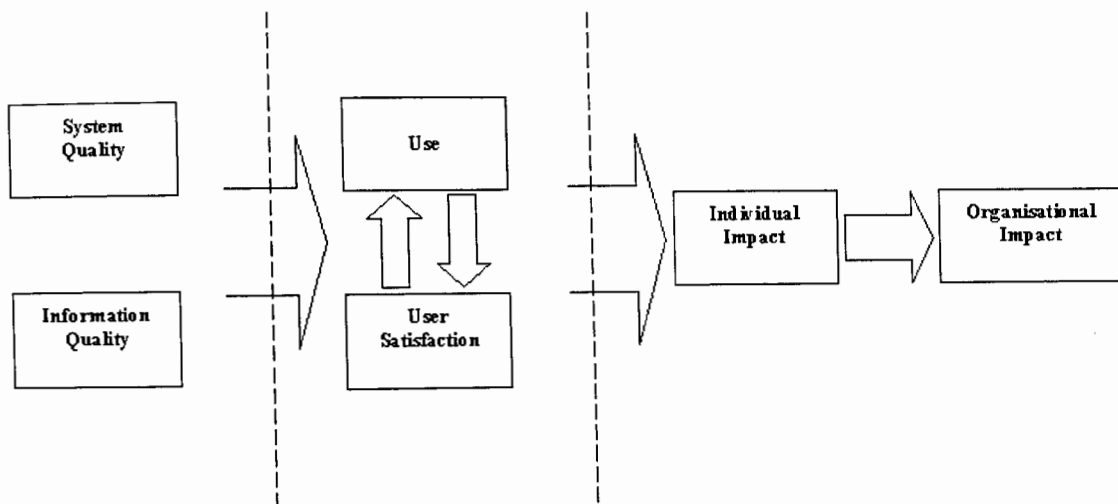
## RESEARCH AND METHODOLOGY

There is a substantial body of literature in the IS discipline regarding the evaluation of Information Systems and it is this literature that forms the basis for the evaluation in this study. However, the nature of this evaluation is problematic in regard to electronic marketplaces which are not necessarily definable as IS. This study, therefore initially considers the use and adaptability of IS evaluation methods and their relevance to electronic marketplaces.

## Evaluation of IS benefits

The evaluation of benefits in IS has been the subject of much debate. How to measure benefits and define effectiveness is a difficult question and one that has provoked a number of studies over the years. Earlier evaluations placed more emphasis on the technical issues involved in IS (Serafeimidis & Smithson, 1994) and transaction uses and neglected the 'ultimate success dimension' of organisational benefits (Mirani & Lederer, 1998). Hirschheim and Smithson (1988) argue that the treatment of IS evaluation as a technical problem leads to meaningless conclusions as it does not assess the impact on users' jobs and social environment. As the discipline of IS matured and IS systems became more pervasive and complex, the need for methods of evaluation which appreciated the intangible, defined by Kaplan (1986) as 'revenue enhancements', as well as tangible outcomes was recognised and the use of more interpretive evaluation methods has developed. [(Mirani & Lederer, 1998, Hirschheim & Smithson, 1988, Serafeimidis & Smithson, 1994, DeLone & McLean, 1992). These interpretive methods require an understanding of the nature and purpose of the evaluation and the social context and process if they are to be effective (Walsham, 1993).

Recognisable tools are required to carry out these evaluations in order to maintain clarity and transparency in the evaluation and to allow for a cumulative tradition of comparative studies to be made. Despite the elements of uniqueness in the installation and use of Information Systems there remain similarities in the benefits to be gained. It is therefore reasonable that measurement tools can be developed and adapted to fit individual IS. The classic study by DeLone and McLean (1992) examined many of the earlier studies carried out in the discipline and condensed them into six categories. These categories address the different areas of evaluation that can be studied, but are also inter-related and inter-dependent.



*Figure 1: DeLone and McLean's IS Success Model*

Several studies address one or more of these categories and models have been developed to progress research in IS evaluation (Bailey & Pearson, 1983; Ives, Olson, & Baroudi, 1983; Lucas, 1981; Mirani & Lederer, 1998; Srinivasan, 1985). However, although DeLone and McLean did not collate the list of MIS success factors to be used as a model, this study uses it to identify where the major benefits of electronic marketplaces lie. This will establish a starting point for the ongoing evaluations, based on empirical evidence, that will be required as electronic marketplaces continue to develop, consolidate and mature.

## Electronic Marketplaces as Information Systems

There are difficulties in measuring and evaluating the benefits of e-marketplaces according to models developed for Information Systems, where installation, training and use follows a more recognisable pattern. E-marketplaces vary considerably according to the type of industries they are addressing, the services they are offering and the nature of their ownership. Companies do not 'install' an e-marketplace, but participate at a chosen level through the Internet. Participation may require substantial commitment including licensing fees and integration of legacy systems for more complex sites such as Covisint (<http://www.covisint.com>) or simply require access to the Internet for less complex sites like Cargofinder (<http://www.cargofinder.com>).

The different levels of service offered by the varying e-marketplaces contribute a considerable range of benefits. At the most basic level of identification of a new supplier, where the major benefits relate directly to cost savings, evaluation by cost-benefit analysis may be feasible. Even here there are difficulties as although costs are easy to identify and quantify they do not provide a comprehensive picture of the hidden true costs (Hirschheim & Smithson, 1988). However, the more complex markets, such as those being developed by industry consortia, offer a greater range of services which, in many cases, are moving towards substantial contributions of information to meet both tactical and strategic planning requirements. At this level, the marketplaces are recognisably Information Systems and the evaluation tools developed for IS have relevance.

### Methodology

A body of available business literature was analysed to accumulate a list of benefits regarded as prevalent in electronic marketplaces. The business literature consisted of both online sources (e-zines, electronic periodicals and journals, and business research reports) and offline sources such as business periodicals, newspapers and computer magazines. A list of benefits from approximately 150 articles was collated and consolidated to remove duplicates.

Given the fluid nature of e-marketplaces where failures, mergers and newcomers contribute to an unstable arena, no attempt was made to sort benefits on an individual market basis or to categorise the types of e-marketplace. The list of benefits made was mapped against Delone and McLean's success measures, according to the six categories (Table 2), to evaluate where the benefits lie. This establishes a broad starting point from which the identified benefits can be continuously evaluated, through empirical studies, as marketplaces mature.

The benefits discussed in this article are collated from subjective sources and therefore include some less tangible benefits which relate to the various stakeholders involved in the use of an electronic marketplace. For example, 'enjoyable' and 'easy to use' are not identifiably company benefits except in relation to the motivation to use the technology which enhances the work flow. In this respect the interpretation of some of the benefits by the researchers becomes part of the interpretive nature of the research (Walsham, 1993).

## BENEFITS OF ELECTRONIC MARKETPLACES

Table 2 shows the list of benefits gathered from the business press categorised according to DeLone and McLean.

System quality	Information quality	Information use
Ease of use Convenience of access System flexibility Usefulness of features and functions Response time Integration of systems	Current Timely Reliable Useable Complete Accurate Free from bias	Purpose of use Recurring use Motivation to use
User satisfaction	Individual impact	Organisational impact
Overall satisfaction Information satisfaction Full information required Enjoyment Decision-making satisfaction	Problem identification, information awareness and decision effectiveness through provision of : Analytical capabilities for business analysis Market intelligence Forecasting Greater visibility of supply chain Project management collaboration Information sharing Interorganisation connections Instant communications Mediated business processes	Operating cost reductions: Reduced transaction costs Controlled spending Cheaper prices Savings on logistics Savings on collaboration Savings on design Reduced marketing costs Lower inventory carrying costs For smaller companies by aggregation  Overall productivity gains: Overall time savings Process efficiencies Better inventory management Shortens product time to market  Staff reductions  Increased sales by: reaching new markets reaching more buyers/suppliers global exposure  Contribution to achieving goals through improved management of data and 'near perfect' information flow  Increased work volume by improving efficiency of information flows and collaborative working practices  Service effectiveness: customer relations management loyalty building optimising relationships

**Table 2: Benefits of Electronic Marketplaces Categorised under MIS Success Measures**

## DISCUSSION

The mapping of cited e-marketplace benefits into each category indicates that there is scope for a wide variety of measurements to be used in ongoing evaluations. In selecting the measurement tools it is necessary to consider the reason for the evaluation and the nature and context of the organisation requiring the evaluation (Walsham, 1993). The categories are inter-related and need to be considered against each other. For example system quality has perhaps become a less accurate measure of an Information System as hardware and software reliability has improved and familiarity with technologies like the Internet become very widespread. It is, however, closely related to the most commonly used success measure, user satisfaction (Bailey & Pearson, 1983; DeLone & McLean, 1992) which is also described as a surrogate method for 'the unmeasurable result of changes in organisational effectiveness' (Ives et al., 1983). The user satisfaction approach takes into account both the users' satisfaction with the system and with the information received from it, which in the case of e-marketplaces includes decision making satisfaction.

Information is the most frequently cited benefit of many e-marketplaces and the quality of the information is of great importance. The cited benefits under this category were concerned with the delivery of timely, reliable, up to date information that was accurate and complete. If e-marketplaces can live up to their boasts of information quality, and guarantee freedom from bias, then there are two areas of benefits: Firstly, information relating to operational considerations such as extension of markets and supply chain issues. Secondly, at senior management levels where the strategic and tactical contributions have the potential to be very superior and to bring extensive benefits to participants.

Information use, as opposed to quality, is a difficult category to assess without specific empirical research as it measures the amount of use a system has as an indicator of its success within a company. The nature of the use of the e-marketplace will depend on the facilities on offer and whether the user is conducting transactions (thereby obtaining the best price for the product or service in question) or finding information for other purposes. Business reports suggest that the uses of information from e-marketplaces will be far-reaching which indicates that the motivation for frequent use will be strong.

Several of the benefits described in the business press could be mapped against success measures found in the individual impact category. These benefits relate to the range of information and levels of collaboration that the e-marketplaces can offer through their value-add facilities rather than supply chain transactions. If these benefits can be realised the potential for supporting decision making and strategic planning at upper management and executive level is enormous. This is a facet of electronic marketplaces that promises much but is yet to prove deliverable.

The list of benefits indicates that the full impact of electronic marketplaces will fall within organisational benefits. Again, if they are realisable then the implications for a shift in emphasis from a supply chain tool to a management tool are considerable. Previous studies have used some measures of organisational impact as an indication of IS effectiveness (Ein-Dor, Segev, & Steinfeld, 1981; Jurison, 1996) but it is interesting to note that the anticipated benefits of e-marketplaces meet all the measures listed by DeLone and McLean. These benefits must be repeatedly measured and evaluated against the needs of an organisation both to ensure that the benefits exist and that the organisation is realising them (Ward, Taylor, & Bond, 1996). This is an area that is of particular importance to practitioners in an era of rapid change and intense competition where speed in decision making and strategic planning is required to meet the challenges.

## **IMPLICATIONS FOR IS BENEFITS EVALUATION**

Although the benefits of e-marketplaces may appear to map quite neatly onto the Delone and McLean framework, this exercise has highlighted a number of implications for IS benefits evaluation research:

### **User Satisfaction**

The frameworks constructed in the early to mid 1990s provide an internal focus on the benefits of IS. User satisfaction has frequently been cited as a key benefit for most systems as discussed above. However, the users in studies of this nature were mostly employees of the organisation, whereas today customers are often the 'real' users of Web based applications. Their involvement and participation in design and development and their general satisfaction with the completed systems are frequently overlooked. In relation to e-marketplaces however, user satisfaction could be expected to be relatively low in importance. The adoption of e-marketplaces is a strategic move for an organisation and one that goes beyond the satisfaction of users. E-marketplaces are a business model facilitated by technology and the decision to adopt e-marketplace trading would be dictated by major organisational issues.

### **Organisational Benefits**

Organisational benefits have more recently been cited as the driving force behind Information Systems with strategic underpinnings. Few studies have investigated the use of Information Systems as strategic drivers, and their role in creating options for the future and new market alliances. So why are organisations participating in e-marketplaces? Some may rationalise decisions in terms of convenience, cost savings etc., but for many large organisations it may well be that they simply cannot afford to be left out. In other words, e-marketplaces are rapidly becoming the entry level business model for procurement. In the mining industry for example, all the major players including Alcoa, BHP, and WMC are simultaneously partners and competitors in a major mining industry e-marketplace, Quadrem (<http://www.quadrem.com>). It is difficult for one company to opt out when it would potentially be disastrous not to be associated with such leading edge developments in the industry. Companies must balance the need for participation at any cost against the costs involved. We argue that IS benefits evaluation has looked for rational benefits which are often the easiest to see when in reality fear and creating new market alliances maybe behind companies participation in e-marketplaces. For these reasons research into the organisational benefits of IS needs to be revisited.

### **Static View**

Reasons for adopting technologies and their perceived benefits change through time. Most IS benefits evaluation research takes a rather static view of benefits. When business models are rapidly evolving, e-marketplaces being a good example, the benefits also change rapidly.

### **Process of Evaluation**

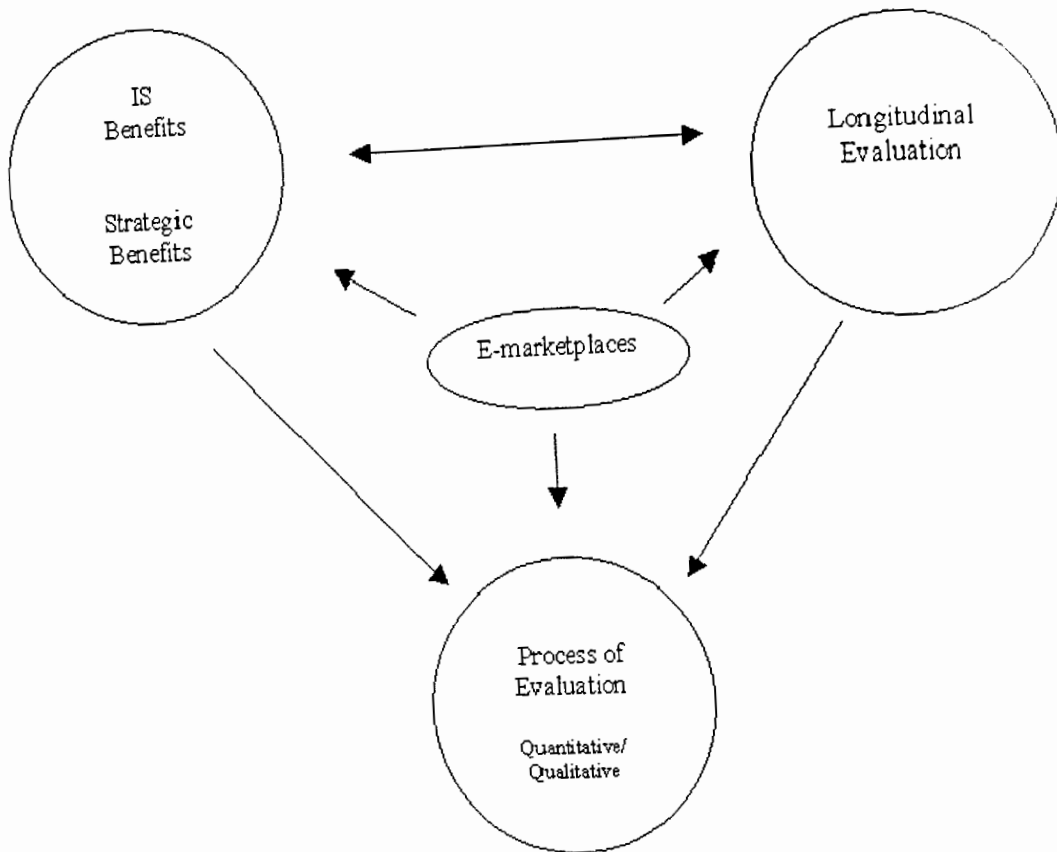
It is clear that the process of evaluation can influence the outcomes in terms of the benefits obtained. If an organisation can see immediate savings through using e-marketplaces then it may ignore the need to analyse the costs associated with the model (including such time-intensive tasks as putting bids together).

We suggest that IS benefits can only be examined by considering three aspects:

IS benefits evaluation (including organisational strategic benefits)

Longitudinal evaluation

The process of evaluation



**Figure 2: Evaluating the Benefits of E-marketplaces**

Our current research projects are investigating e-marketplaces in the mining industry using these three facets of evaluation as a basic model.

## CONCLUSION

Electronic marketplaces are one of the new technologies that are driving changes not only in operational processes, but also in decision making and strategic planning methods. Despite the relative immaturity of the marketplaces they are offering a wide range of benefits in many areas of commerce. The identified benefits lie mainly in the categories of individual and organisational impact; categories of IS success measures which have been recognised as important areas requiring more rigorous evaluation through empirical studies.

However, while the argument has been made that e-marketplaces could be evaluated using tools developed for IS evaluation, the results indicate that such evaluations are inadequate. The potential uses of the information facilities that are being, and will be, offered by electronic marketplaces go beyond the measures available in benefit evaluation tools examined in this article. Effective evaluation must build on these tools to include assessment of strategic benefits which may affect not only organisational, but also industry, structures. Additionally, the process of evaluation is becoming an important element in the study of benefits evaluation as many reasons for participating in new technologies appear to be based on unarticulated intangibles, which need to be identified. Lastly, given the immaturity and the speed of development of electronic marketplaces, empirical studies in this area should take a longitudinal approach to the task of evaluation to enable a more accurate view of the benefits to be gained from this dynamic environment.

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# Developing an E-commerce Best Practice Model for Victorian Wineries: An Agenda for Research

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## ABSTRACT

*This paper describes a framework for researching the adoption of e-commerce by Victorian wineries. The proposed framework constitutes the initial stage of ongoing research into wineries and how the Internet can be used to deliver advantages in this internationally recognised export sector. The research incorporates aspects of Roger's diffusion of innovation model, recommends the use of OECD e-commerce performance indicators as a means of assessing wineries for e-commerce readiness, intensity and impact. Expected outcomes are the identification of how wineries are successfully using e-commerce and the synthesis of a best practice model based on the analysis of case studies and surveys.*

*Keywords: Electronic commerce, Victorian wine cluster, OECD e-commerce indicators, Internet diffusion, adopters and non-adopters.*

## INTRODUCTION

Internet-based transactions are growing rapidly worldwide, although at varying rates in different countries (OECD 2000b). During the 1980's and early 1990's, Electronic Data Interchange (EDI) was widely accepted as the electronic business technology of choice that was used by organisations for information exchange. The drawback was that EDI was proprietary and expensive, hence generally only available to large businesses. The advent of the Internet has removed these impediments and the adoption of e-commerce by small businesses has occurred in the last five years. Electronic commerce is a new business paradigm increasingly used by organisations around the world to capitalise on the potential of new technologies such as the Internet and the World Wide Web. Consequently, e-commerce can create considerable opportunities allowing firms to expand their customer base, rationalise their business and enter new markets (OECD 2000b; Porter 2001).

Various definitions of e-commerce have been suggested. E-commerce has been defined as:  
'the buying and selling of goods on the Internet' (ATO 1997: p12).

'the use of computers and electronic networks to conduct business over the Internet or other electronic network' (PriceWaterHouseCoopers 1999: p4).

'encompassing all commercial transaction activities' (Groves and da Rin 1999: p2).

'the buying and selling, marketing and servicing, and delivery and payment of products, services and information over the Internet, intranets, extranets and other networks between an enterprise and its customers, suppliers and other business partners' (O'Brien 1999: p344)

The Organisation for Economic and Co-operative Development (OECD) argues that to be able to determine how e-commerce is used and what impacts occur from its use, an effective and uniform definition of e-commerce is necessary. The OECD, in consultation with member working groups has linked the definition of on-line e-commerce to the Internet transaction, and consequently broadly defines Internet e-commerce as:

‘the sale or purchase of goods, the exchange of information, whether between businesses, households, individuals, government, and other public or private organisations, conducted over the Internet’ (OECD 2000c: p2).

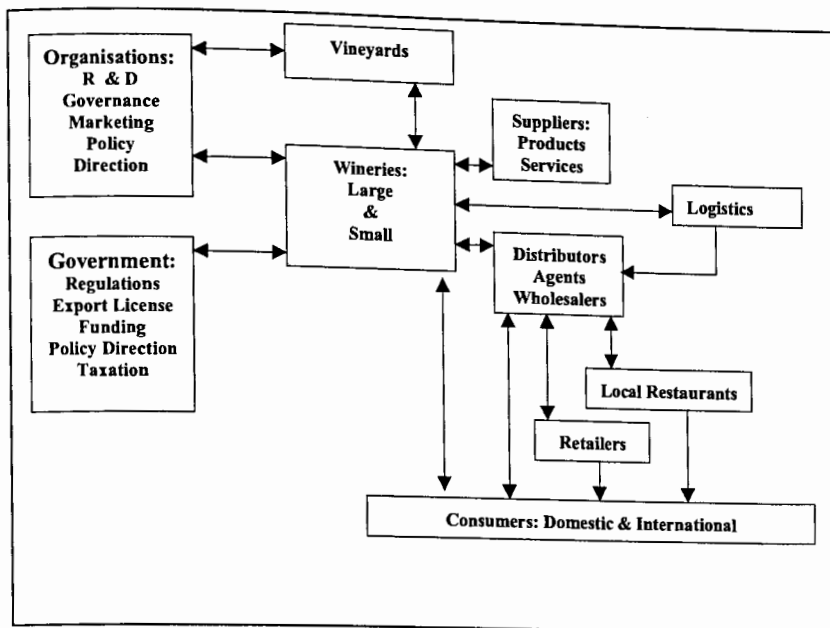
For the purpose of this study, the OECD definition will be used as a simple definition of Internet based e-commerce (IEC).

## **AUSTRALIAN AND VICTORIAN WINE: A BACKGROUND**

The Australian wine industry has undergone a renaissance over the last twenty years. Australian winegrowers and the wine industry can be regarded as having global best practice in wine making and viticulture (Anderson 2000; Hardie 2000).

The last five years has been extremely successful for the industry with wine exports contributing some \$1.6 billion to the national economy to the end of August, 2000. In 1995, a comprehensive analysis of the entire wine industry was undertaken and coordinated by the Australian Wine Foundation, leading to the development of the industry’s 30-year plan— Strategy 2025. Strategy 2025 provided a broad national blueprint for progress toward the target of \$4.5 billion in annual sales by 2025 by being the world’s most influential and profitable supplier of branded wines, pioneering wine as a universal first choice lifestyle beverage (Hoj and Hayes 1998; Hardie 2000; Marsh and Shaw 2000).

Since 1998 the grape crush has increased some twelve fold, whilst in the same period the number of wineries has increased by 350—many of these new wineries being small in size. The industry structure is such that the top three wine groups (Southcorp, BRL Hardy & Beringer Blass) account for some 75% of the wine export value (the top 10 have 85% of the value). Consequently, small wineries, which have an annual grape crush of less than 1000 tonnes, comprise a substantial proportion of all winemaking businesses in this country. When compared to other states of Australia, a greater proportion of Victorian wineries are classified as being small to boutique (n=336) Victorian wineries can thus be classified as small to medium (SME) size rural businesses, which collectively interact with a cluster of specific industry suppliers (n=708), wine organisations (n=167) and industry distributors (n=154) (ANZWD 2000; VWTC 2000). The interaction of Victorian wineries with the general wine industry is depicted in figure one.



**Figure 1: Victorian wine industry participants, adopted from the Californian Wine Cluster**  
(Porter, 1998, the ANZWD, 2000 and Marsh & Shaw, 2000)

## SMALL TO MEDIUM SIZE BUSINESSES AND THE INTERNET

A number of Australian studies have been conducted examining the use of information technology and the Internet in Small to Medium Enterprise (SME) (Poon and Swatman 1997; Burgess 2000; NOIE 2000). The most prominent of these has been a regular study of the use of IT in small businesses conducted by Pacific Access for Yellow Pages Australia with Telstra (Pacific Access 2000). More recently the National Office for Information Economy has released a report-card on the use of the web and e-commerce by business (NOIE 2000). These studies provide valuable statistics in relation to computer usage and electronic commerce in relation to an organisation's size, which is broken down into general industry areas. They do not attempt, however, to examine the underlying reasons as to how, why and when small businesses use these technologies, for example, their strategic motivations for using e-commerce. No studies focus or detail specific industries to identify the leading users (innovators, early adopters) of the Internet within that industry. Many studies take a snap shot at a particular instance in time and report findings (eg Pacific Access study). Little, if any literature exists on specific Australian rural firms detailing and describing the adoption and use of the Internet or e-commerce. A general study on farm use of the Internet (n=27 participants) has been undertaken by Groves and da Rin (2000). Some case studies (n=22) that relate to rural e-commerce in Australia have been described by Papandrea and Wade (2000), and e-commerce use by the beef industry (n=22 businesses) has been reported by Gregor and Jones (1999). Internet marketing (n=60 participants) in South Australian vineyards has been investigated by Goodman (1999), however, little effort has been undertaken to explain, document and map specific groups (adopters through to laggards) or explain some of the supply chain effects (if any) within the wine industry.

Numerous studies, after generalised investigations into the use of e-commerce by business, conclude by calling for industry specific research to expand the understanding and literature base on e-commerce use by specific industry sectors (Parao and Campbell 1998; PriceWaterHouseCoopers, 1999; NOIE 2000; OECD 2000a; OECD 2000b).

## **RATIONALE FOR THE RESEARCH**

### **E-commerce adoption and the wine industry**

The Wine Industry 30-year blueprint (Strategy 2025) does not mention issues associated with interactive technologies such as e-commerce or Internet use/adoption. This may have been an oversight at the time (1995) when the use of the Internet was still in its embryonic stage. The pressures for the adoption of e-commerce by agribusiness will increase worldwide (Gregor and Jones 1999; Badger 2000; Rowley 2000), and the wine industry will not be isolated from this trend. Industry leaders such as Southcorp, Miranda and Tyrrells have planned, or are anticipating, the move to electronic business by utilising the Internet as the central technology with new supply chain management and enterprise resource planning systems. These large businesses have concluded that earnings growth in the future will not only be tied to the revenue from the phenomenal export growth to date, but to efficiency and cost management strategies—these strategies being inextricably tied to the electronic streamlining of supply chains and customising business processes (Braue 2001).

Some wine industry literature on e-commerce and the use of the Internet exists (Goldman and Armstrong 1999; Goodman 2000; Horlin-Smith 2000), however, there are no specifics on issues associated with direct selling to consumers (B2C), dealings that wineries have with government, especially for document exchange, or the way that wineries may purchase on-line from their suppliers (B2B). At this point in time, the industry appears to have been slow to adopt e-commerce for competitive advantage, when compared to other Australian sectors (Major 2000). Adoption of the Internet will benefit areas such as grape-growing, winemaking, administration and marketing, warehousing and distribution (Horlin-Smith 2000). E-commerce has the potential to streamline information flows and transactions between constituent entities within the supply chain, resulting in cost savings and shorter delivery times. For the very small wineries a direct interaction with customers may allow for the bypassing of certain elements in the supply chain (eg wine distributors, agents and retailers), potentially leading to cost reductions and increased market penetration.

Consequently, in a global economy, within an industry that will undoubtedly encounter fierce competition from the traditional wine producing countries (Italy, France and Spain), the need for successful adoption of best practice commerce, be it electronic or otherwise becomes a strategic necessity. Within the Victorian wine industry, where the majority of firms are small, best practice in e-commerce can overcome some of the numerous disadvantages of being small and remote. This will enhance the financial health of the winery business, the Australian wine industry in general and the Victorian State economy.

### **RESEARCH INVESTIGATION, OUTCOMES AND THEORETICAL FRAMEWORK**

The research will examine the use of e-commerce within Victorian small wineries in order to identify the adopters (innovators and early adopters) and non-adopters (laggards or resisters) on the basis of Roger's Diffusion Theory paradigm. Barriers to the use of e-commerce will be determined to identify the areas that the industry needs to address so as to facilitate an increased rate of uptake of this process. The benefits from the successful use of e-commerce will also be identified and from this a model will be developed for the most effective use of e-commerce within the industry.

The suggested outcomes of the study include:

The identification of the adopters and non-adopters of e-commerce within the industry.

The determination of pertinent business attitudes and actions (management strategy) of the adopters. Specific questions to be addressed:

To what degree of complexity have these businesses adopted e-commerce (this may range from simple e-mail & web promotion to full e-commerce transactional facilities with consumers and suppliers)?

What problems were encountered in establishing an e-commerce strategy?  
 What resources were required and which were most important in establishing e-commerce?  
 Can specific indicators for wineries be identified for measuring success of an e-commerce venture?

The determination of barriers to adoption. Analysis of business attitudes and actions of non-adopters will provide a profile of areas that need to be addressed to overcome resistance to e-commerce use. The formulation of a robust model that reflects best practice in the use of e-commerce within wineries. The model will be developed from the collation of data and case study information detailing measures for successful and effective use of e-commerce within Victorian small wineries.

## THEORETICAL FRAMEWORK

### Diffusion Theory

Within the realms of innovation research the dominant paradigm is that of innovation diffusion. Innovation diffusion has had considerable success in describing how innovations move, or diffuse, through large populations either to be adopted or to be rejected. Roger's diffusion of innovation model is a well documented and consistently researched framework applied across many disciplines. Innovation diffusion is based on the notion that adoption of an innovation involves the spontaneous or planned spread of new ideas. Rogers defines an innovation as:

"...an idea, a practice, or object that is perceived as new by an individual or another unit" (Rogers 1995:p11).

The successful diffusion of an innovation follows the S-shaped rate of adoption, a curve that fits a normal distribution. The cumulative S-shaped rate of adoption curve is depicted in figure 2 showing the relationship between the adopters and late-adopters over a period of time. The four main elements of diffusion as proposed by Rogers, and which have been identified in all diffusion research studies, are the innovation itself, the communication channels for disseminating information on the innovation, a time period and the social system that adopts the innovation. Hence, diffusion is a process by which an innovation is communicated through certain channels over time amongst the members of a social group. The social group for the purpose of this study will be the members or individuals who operate Victorian wineries and the innovation will be deemed to be Internet based e-commerce.

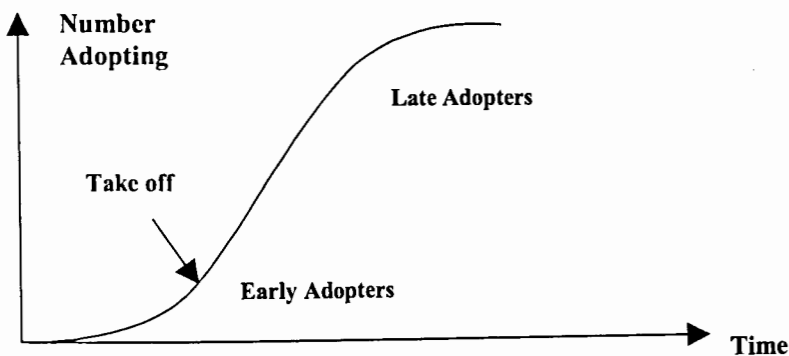


Figure 2: The innovation diffusion process over time  
 (Adopted from Rogers, 1995:11).

Initially, the innovation is used by the early adopters and the curve is reasonably flat. However, as more members of the group adopt the innovation the curve "takes off". As the late adopters start to use the innovation, a saturation point is eventually reached indicating the innovation has diffused through the population.

As mentioned the S-shaped diffusion curve follows a normal distribution. Rogers breaks the normal distribution curve into five sections (figure 3) — each section representing a particular group of the community that adopts the innovation, each group having peculiar characteristics, behaviours and social conditioning. Briefly, Roger's proposed adoption/diffusion continuum recognises five categories of participants:

The innovators who tend to be first users of a new idea and constitute the first 2.5% of individuals in a system

The early adopters who may be technically sophisticated and interested in the innovation for solving business problems and gaining competitive advantage  
 The early majority who are pragmatists and constitute the first part of the mainstream when it comes to the adoption of the innovation  
 The late majority who are less comfortable with technology and are the sceptical second half of the mainstream  
 The laggards or 'resistors' who may never adopt the innovation

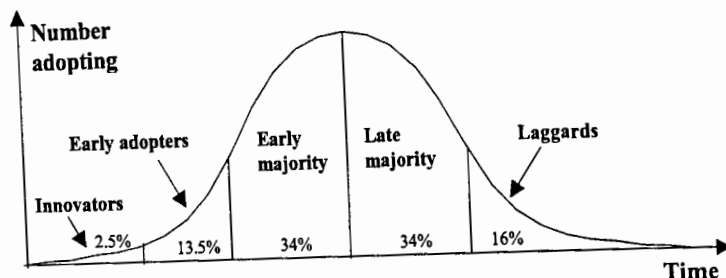


Figure 3: Categories of Adopters  
 (Adopted from Rogers, 1995:262)

Because the Internet is new to many businesses, wineries being no exception, it is unlikely that sufficient adoption of the Internet will have occurred to be able to use this five category classification. Rogers (1995) alludes to this difficulty of classification, pointing out that it occurs when an innovation hasn't achieved 100 percent use. He suggests that this problem can be overcome by combining the innovation groups, to form a composite class. Consequently, the proposed study will use two categories to classify the members of the study system— those that are using the Internet/e-commerce (adopters) and those not using this new innovation (non-adopters).

## MEASURING E-COMMERCE

The measurement of e-commerce has been problematical with different countries having their own methods and metrics. The OECD has proposed an e-commerce measurement framework with definitions and indicators by which it hopes will address the inconsistencies that currently prevail. The framework has the support of member countries, interested parties and researchers, and identifies three stages of the e-commerce life-cycle— stages that can be related to cumulative S-shaped adoption-diffusion curve (figure 4). Each stage has a group of indicators that will reflect most appropriately the success or otherwise of e-commerce use, thus enabling comparisons across countries, sectors or industries. As the use of e-commerce matures, interest will not be so much on e-commerce growth, but how it contributes in adding value and creating wealth for the businesses that utilise it. Hence, the measure of e-commerce requires 'qualitative' measures as one traverses the life cycle (Simpson 1999; Colecchia 2000).

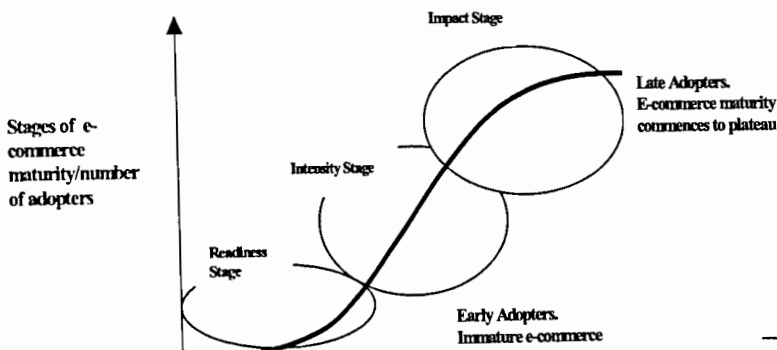
The three stages of the e-commerce maturity are related to readiness of adoption, intensity of use of e-commerce and the impacts of e-commerce. A brief summary of the three stages follows:

**E-commerce readiness:** This constitutes the initial stages of adoption. There should be an attempt to identify the enabling factors and the barriers to e-commerce adoption. Readiness measures have received the greatest attention so far. Two categories of indicators have been developed: the first relates to the availability of the telecommunications infrastructure, whilst the second addresses the skills and training issues associated with e-commerce.

**E-commerce intensity:** As the rate of adoption of e-commerce accelerates, the focus of investigations shifts to the degree and frequency (intensity) of e-commerce use to enable policy makers to address imbalances. These issues investigated relate to the state of e-commerce usage, volume, value and nature of the transactions. Intensity measures are important in identification of who is exploiting e-commerce possibilities and who is not, and to identify leading users (pro-active businesses).

**E-commerce impact:** As adoption becomes wide spread, the focus of investigations addresses how e-commerce has impacted on the social group and cluster participants. Measuring the impact of e-commerce on the economy and society becomes important. Investigations address the characteristics associated with 'value added' and 'multiplier' effects of e-commerce— have there been effects beyond substitution, with the creation of new wealth or knowledge (value added). Key measures need to evaluate whether and to what extent e-commerce makes some kind of difference in terms of efficiency and/or the creation of new sources of wealth. Figure 4 depicts the adoption-diffusion S-curve and the e-commerce maturity stages.

**Figure 4: S-curve rate of innovation adoption with the levels of e-commerce activity**



depicting the three e-commerce life-cycle stages  
(Adopted from Colecchia 1999:4)

Each stage of maturity will require different indicators to measure readiness, intensity and impacts of e-commerce.

As part of the OECD efforts in developing a measurement framework, a set of core performance indicators have been identified that address the measurement of the e-commerce stages of readiness, intensity and impact. These core performance indicators will be used as a reference for the research study. The OECD indicators have been developed in conjunction with member countries, the wider international community and the various e-commerce stakeholders (Simpson 1999; Colecchia 2000; OECD 2000c; personal communication with Colecchia, April 2001).



## RESEARCH METHODOLOGY AND DESIGN

There are three areas of data collection that can be identified in undertaking the proposed study.

### Identification of adopters and non-adopters of the Internet

Examination of wine industry records going back to the early 1980's constitutes the main source of time series and historical data. Winery records have been compiled by the industry from statistics and data supplied by the Australian Bureau of Statistics, the Australian Wine and Brandy Corporation, and the wineries themselves. The records contain data on all relevant aspects of wineries ranging from their geographical location, export activities and a comprehensive listing of contact information—they are referred to as the 'bible' by industry participants. Since 1995, the business contact information for wineries commenced with the inclusion of email addresses and web site URL, which ostensibly identifies the wineries that are using the tools that enable them to undertake e-commerce (adopters of e-commerce tools). The directories also identify the wineries that have no on-line presence, and it can be assumed that they are not using the Internet for business purposes (non-adopters of e-commerce tools).

### Identification of barriers to the use of the Internet

Survey questionnaires will be used to gather data from the non-adopters on the specific issues relating to barriers they have encountered in their attempts to use the Internet for business purposes (*Why aren't you on-line yet?*).

### Case studies and data collection to identify best practice for the use of the Internet/e-commerce

A survey questionnaire will be used to collect data and information from the wineries that use the Internet (adopters) as part of their normal business practice. Information on business attitudes and actions, and the level of e-commerce complexity, will be gained at this data gathering stage. Wineries that wish to participate in case studies will be identified. The collected case studies will be analysed and used to formulate an e-commerce best practice model for Victorian wineries. The proposed methodology is depicted in figure 5.

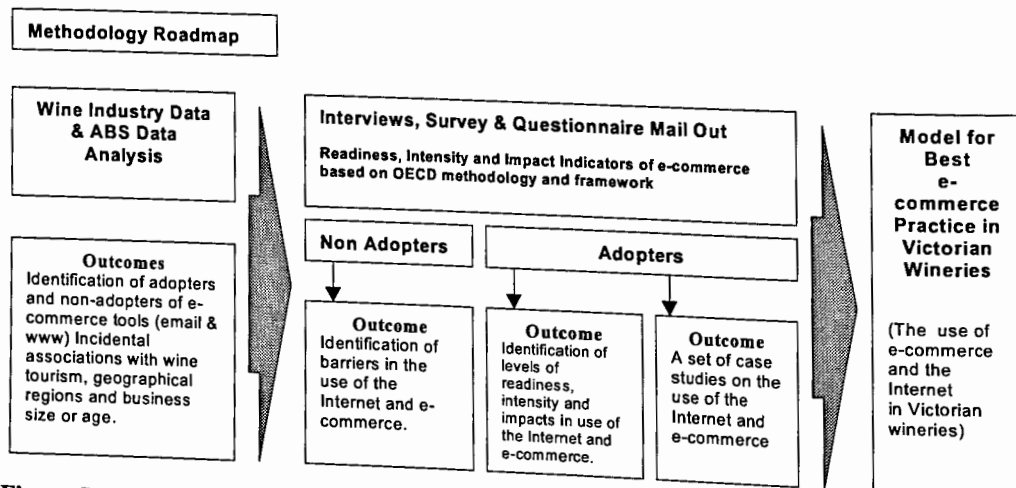


Figure 5: Research methodology roadmap indicating relationships between data and information sources, outcomes of adopter and non-adopter data collection and strategy for best practice development (model synthesis).

## CONCLUSION

This proposal establishes a basic framework and direction for discovering and exploring the use of the Internet and e-commerce in Victorian wineries. The research outcomes will not only add to the general e-commerce knowledge literature, but also to the understanding and practice of e-commerce in an important export sector. The research design is such, that there are four measurable outcomes at different stages of the project. Each

outcome constitutes a form of knowledge discovery— which can be immediately published if desired. Immediate publication effectively allows the research to be evaluated by peers, so as to solicit review, comments, approval and critiques of the new contributions. The synthesis of a best-practice model will form a template for wineries to use, to either establish and/or enhance their e-commerce business processes and practices.

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# Measuring Costs/Benefits of E-business Applications and Customer Satisfaction

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## ABSTRACT

*Businesses need to measure the costs and benefits associated with an E-business application. As E-business applications are connecting directly to two critical business constituencies: customer and employee, customer satisfaction has become a criterion to measure the application success. This paper described a research project that identifies cost and benefit factors of E-business applications and explores the correlation between customer satisfaction and relevant cost/ benefit factors. The research is based on two respective surveys: customer oriented and business oriented.*

*Keywords: Electronic businesses, Electronic commerce, Assessment, Customer satisfaction*

## INTRODUCTION

Over the last few years the Internet has evolved from being a scientific network only, to a platform that is enabling a new generation of businesses -- electronic businesses (E-businesses). E-business provides the convenience, availability and world-wide reach of Internet to enhance existing businesses or create new virtual businesses (Amor 1999). The E-banking, E-auctioning and E-directories are all the successful E-businesses. The question is no longer why or whether a business should develop their E-business or when, but rather how to do so most effectively (Cho 1999). Making E-business applications assessment can help answer this urgent question.

Before adopting an E-business application, organizations need to assess its real business values and benefits, and to compare its costs with those of the associated investment. The intangible and multi-criteria nature of most E-business costs and benefits makes it difficult to assess an actual business case. There have been numerous attempts documented in the literature that assessed online application development and involved identifying benefits for E-business applications (see, Ng et al. 1998, Cho1999, Giaglis et al. 1999, Trepper 2000). Some guidelines for broad categories regarding costs/benefits of E-business applications were given (Buchanan and Lukaszewski 1997). These include cost reduction, revenue growth, improved customer satisfaction and quality improvements. However, above research didn't come up with a straightforward model to quantify the cost/benefits of an E-business investment. The majority of above research focused on evaluation of the advantages and strengths of E-business with a number of measurement criteria from the business viewpoint.

As E-business applications are connecting directly to customers, customer satisfaction becomes one of the most important measures to E-business success. An increased awareness of the importance of customer satisfaction issues has prompted the research community to explore customer satisfaction measurement (Kurniawan 2000). Some measurement approaches and relevant results have been reported (Cho 1999). Generally three types of customer satisfaction measurement were used: the relative importance of attributes, dimension of customer satisfaction and added customer value.

'Attribute importance' means every service attribute contributes diversely to the overall satisfaction of the customer. 'Dimension of customer satisfaction' means every dimension of satisfaction gets its own score, which then can be compared to evaluate the strengths and weaknesses of the applications. 'Added customer value' is generated through dividing the business' overall customer satisfaction by the scores of all businesses competing in a certain market (Amor 1999).

However, very little research exists today for assessing E-business applications from both the business and its customer points of view simultaneously. Particularly, there is a lack in the study of correlation between customer satisfaction and relevant cost/benefit factors. This research uses the cost and benefit as two measurements from company point of view, and customer satisfaction as a measurement from the customer point of view to assess E-business applications. This research identifies main cost/benefit factors and presents a set of results describing the relationships between cost/benefit factors and customer satisfaction. The results are based on two respective surveys conducted in New Zealand: customer oriented and business (E-business supplier) oriented. The surveys focused on the E-business applications in small and medium businesses.

Following the research (Lu et al. 2001, Lu 2001), this paper describes the research method of this project in Section 2. Section 3 examines customer satisfaction with E-business applications. Section 4 identifies main cost factors of E-business applications and explores the relationships between these cost factors and customer satisfaction. Section 5 investigates main benefit factors and the relationships between these benefit factors and customer satisfaction. Findings and conclusions are presented in Section 6.

## RESEARCH METHODS AND DESIGN

At the highest level an E-business application success means it achieves at least one of the two objectives: to reduce operating costs (bottom line) - by reaching existing business partners, customers, and channels more effectively and efficiently; and to increase revenues (top line) - by reaching new customers and new channels with new products and services (Cho 1999). In order to assess E-business success from both business and customer sides this project produced two respective surveys: customer oriented and business (E-business supplier) oriented.

The first survey intended finding which companies had developed E-business applications, and potential customers' assessment for the sample of companies. It was an exploratory desk survey that gathered data about the customer satisfaction with E-business applications. Customers were asked to search business Web sites and fill in a survey. A total of 156 company Web sites were searched and assessed by a customer group from June 20 to September 20, 2000. The 156 companies were randomly selected from 149,974 organizations registered in the UBD E-directory at <http://www.ubd.co.nz> conditional on reaching an appropriate level of E-business development. The sample of companies consists of several industry sectors: Accommodation, Community services, Computing & technology, Education, Finance, Real estate, Retail, Transport & Storage, and Travel.

The second survey made use of a questionnaire in order to gather data about costs and benefits of E-business applications. A pre-test survey enabled the initial questionnaire to be refined. The final questionnaire was posted to the 156 sample companies mentioned above in October 2000. The respondents were asked to answer questions on a seven-point Likert discrete scale, or given a statement that they were free to choose 'yes' or 'no'. Out of the 44 items in the questionnaire, 17 were related to the costs of setting up and maintaining E-business applications and 21 were related to business benefits. A total of 56 responses were obtained with the analysis of this paper based on 45 completed questionnaires. In order to obtain related perceptions and detail not mentioned in the questionnaire, interviews were conducted with 5 selected businesses from the sample companies.

## MEASURING CUSTOMER SATISFACTION WITH E-BUSINESS APPLICATIONS

Customer satisfaction is commonly acknowledged as the most useful measurement of E-business application success. Customer satisfaction is not easily measurable and hard to verify or quantify. The study measures the customer satisfaction for E-business applications using the first type of Amor (1999) measurement by utilizing a five-point Likert scale (Ng, Pan & Wilson 1998). A summary of the survey results is presented on the bottom line of Table 1. Of 45 companies, about 13% of E-business applications were marked 'very satisfactory', 40% marked 'satisfactory', and 29% 'just satisfactory'.

Businesses turn to E-business for different reasons and had different measures for their applications success. About 73% of sample businesses indicated 'customer satisfaction' was one of the main measuring criteria for applications success, 44% took 'number of new customers' as a main measure, 36% used 'business partner satisfaction', and 29% indicated 'cost of promoting products' (Lu 2001). This result shows that many E-business applications were focusing on customer services, and prioritised customer satisfaction.

Although most businesses marked 'customer satisfaction' as one of main measures to E-business application success, do these companies have identical views with their customers on the assessment of a successful application? The question 'what do you think of the E-business applications in your organization' was included in the questionnaire with a three-point scale, in order to discover the difference between E-business suppliers' and their customers' assessment. There were 27% of businesses that were very satisfied with their applications, 56% with satisfactory, and 17% not satisfied (column 3, Table 1). In supplier 'very satisfactory' category, 12 (27%) companies were very satisfied with their E-business application, but only 25% of customers were very satisfied, and 33% were satisfied. However, a regression analysis between the extent of customer satisfaction and supplier satisfaction was also produced. The result proved that EC suppliers and their customers, basically, have an identical assessment for EC applications.

**Table 1: Customer satisfaction and supplier satisfaction**

Supplier satisfaction	No	%	Customer satisfaction									
			Very satisfactory		Satisfactory		Just satisfactory		Less satisfaction		Not satisfactory	
			No	%	No.	%	No.	%	No	%	No	%
Very satisfaction	12	27	3	25	4	33	4	33	1	8	1	8
Satisfaction	25	56	3	12	9	36	7	28	1	4	4	16
Not satisfaction	8	17	0	0	5	62	2	25	0	0	1	13
Total	45	100	6	13	18	40	13	29	2	4	6	13

## CUSTOMER SATISFACTION AND COSTS FACTORS OF E-BUSINESS APPLICATIONS

There are a number of item related costs that can be considered. The cost section of the questionnaire asked companies to indicate their costs assessment with each of the cost statements (cost factors) on a seven-point Likert scale (the cost items and assessment results are listed in Table 2), '1' means very low cost and '7' very high. Together these 17 cost items have a strong internal consistency.

Of the sample companies, 9% did think that 'the cost of setting up E-businesses' (factor 1) was very high ('7') in their businesses, 16% did think higher ('6'), 23% marked '5'. The mean value of the item assessment is 3.68 and the variance is 3.74. Table 2 shows that 'the expenses of monitoring site use', 'legal issues', and 'shipping costs' are held lower than other cost items, by contrast, 'rapid technology changes' (factor 11) are considered as a highest cost factor. The item 'lack of skilled personnel' (factor 17) has the highest variance of all.

**Table 2: Assessment and the weights for E-business application cost factors**

No	Cost factors	Percentage of companies on the cost factors (%)										Weight	
		1	2	3	4	5	6	7	N A	Mean	Variance	Mean	
1	Expense of setting up E-business	9	1 6	2 3	1 8	1 1	7 7	9 7	7	3.68	3.74	5.12	
2	Expense of maintaining E-business	14	1 8	2 5	2 3	7	7	2	4	3.21	2.67	5.53	
3	Internet connection	5	2 7	3 6	7	1 4	5	7	0	3.41	2.48	5.21	
4	Hardware/software	5	1 1	1 8	3 9	1 6	7	2	2	3.81	2.02	5.13	
5	Monitoring site use	27	2 3	1 8	1 6	5	0	2	9	2.53	2.4	5.79	
6	Security concerns	14	1 4	1 8	2 7	1 8	2	5	2	3.48	2.71	4.5	
7	Legal issues	27	1 8	1 4	1 8	7	5	5	6	2.95	3.46	4.5	
8	Training	16	1 4	1 8	3 6	7	5	0	4	3.20	2.28	4.98	
9	EC expertise and personnel acquisition	5	2 0	1 4	1 8	1 4	1 1	5	13	3.79	4.11	4.92	
10	Reliable search engines acquisition	11	1 6	1 6	2 0	1 4	7	2	14	3.45	3.65	5.03	
11	Rapid technology changes	5	7	2 0	2 5	1 6	1 4	2	11	4.01	3.46	5.15	
12	Shipping costs	20	1 8	9	7	2	7	7	30	3.03	3.93	3	
13	Personnel requirement and recruitment	14	9	1 1	1 6	1 1	2	2	35	3.23	4.28	3.83	
14	Costs of obtaining information about customers	11	7	2 7	7	9	5	2	32	3.28	4.09	4.8	
15	Time spent on E-business development	5	1 6	2 3	1 6	9	9	7	15	3.74	4.05	4.87	
16	Time spent on E-business maintenance	7	2 3	2 7	1 6	5	7	0	15	3.12	2.7	4.4.2	
17	Lack of skilled personnel	7	1 1	1 6	1 4	9	7	5	31	3.70	4.95	4.67	

In order to explore the relationships between customer satisfaction and cost items a set of hypotheses were designed and evaluated using the analysis of variance (ANOVA) approach. For example: H1: there are significant differences with regard to the time spent on E-business maintenance for the groups with different degree of customer satisfaction (more hypotheses will be discussed in another paper). Here, 'customer\_satisfaction' is defined as an independent variable with five levels, and 'time\_spent\_maintenance' as a dependent variable with seven levels. A one factor fixed effects ANOVA model (Hughes & Grawoig 1971) was used to determine the effect of the independent variables on the dependent measures in individuals (1), where,  $\alpha$  represents the effect on dependent variable 'time\_spent t\_maintenance' under different degrees of 'customer\_satisfaction':



$$[time\_spent\_maintenance]_i = \alpha_i + [customer\_satisfaction]_i + \varepsilon_i \quad (1)$$

The ANOVA results shown on Table 3 indicate that time\_spent\_maintenance is significantly different among the different groups of customer satisfaction ( $p < 0.05$ ). This means an application which received a high customer satisfaction usually required more time spent on maintenance. The result supports H1.

**Table 3: ANOVA results with cell means for the effects on 'time spent on E-business maintenance (16)'**

	Groups	Count	Average	Variance	Source of Variation	F	P-value
Customer Satisfaction	Very satisfaction	6	4.166667	0.566667	Between Groups	4.17889	0.007179
	Satisfaction	17	3.823529	2.029412			
	Just satisfaction	10	2.5	1.166667			
	Less satisfaction	1	3				
	Not satisfaction	6	2	1.6			

The respondents also were asked to indicate the degree of importance for each of the cost factors on a seven-point Likert scale, '1' means not important at all and '7' very important. The mean values are shown in the last column of Table 2. Eight items are identified as the core costs factors which were marked with a higher weight: expense of setting up E-business, maintaining E-business, internet connection, hardware/software, monitoring site use, reliable search engines acquisition, and rapid technology changes.

### CUSTOMER SATISFACTION AND BENEFIT FACTORS OF E-BUSINESS APPLICATIONS

A total of 21 benefit items were taken into consideration in the survey (Table 4). The respondents were asked to indicate their present benefits assessment (1-low benefit, 7-very high benefit) and the ideal rating (1- not important, 7- very important) for each of the benefit factors. The benefit assessment is to investigate the status of respondents' current E-business provision, compared with where they would ideally like it to be. For example, if a company considers that currently the benefits of E-businesses allows it to access a larger market (let's say at a national rather than a regional level), but it would ideally prefer to access a Pacific or global level. Then it would score perhaps '3' on the present benefit assessment and a '6' on the ideal rating. However, each business typically has its own unique requirements and may have to develop other measures to analyze the benefits that are likely to come as a result applied E-businesses. Companies have different needs, competence and motivation, which affect their assessment.

The mean values of ideal rating for the benefit factors are shown on the last column of Table 4. Eight factors are identified as the core factors of benefit, which received a higher weight from the sample companies: access to a greater customer base, broadening market reach, lowering of entry barrier to new markets and cost of acquiring new customers, alternative communication channel to customers, increasing services to customers, enhancing perceived company image, gaining competitive advantages, and potential for increasing customer knowledge. Based on Table 4 a set of correlation analysis between the 'customer satisfaction' and each benefit factor was made using Pearson's correlation coefficients. Items would be retained if the significance level of correlation with the customer satisfaction were less than 0.05. As many businesses' E-business applications focus on customer service, the results reported were same as expected. Almost all benefit factors were significantly corrected with customer satisfaction. The detail is discussed in another paper.

**Table 4: Assessment and ideal rating for E-business application benefit factors**

No	Benefit factors	Percentage of companies on the present benefit assessment (%)										Ideal rating	
		1	2	3	4	5	6	7	N/A	Mean	Variance	Mean	
1	Access to a greater customer base	2	1	1	1	1	1	1	12	4.31	4.46	5.82	
2	Broadening market reach	2	1	1	1	1	1	1	9	4.51	4.62	5.93	
3	Lowering of entry barrier to new markets and cost of acquiring new customers	0	2	1	1	1	1	1	18	4.27	5.25	5.53	
4	Global presence	2	9	7	1	1	4	1	22	3.58	5.75	4.43	
5	Reducing information dissemination costs	2	9	3	1	1	4	9	9	3.93	3.61	5.49	
6	Reducing advertising media costs	1	1	1	1	1	7	7	13	3.60	4.31	5.00	
7	Reducing operation (transaction) costs	9	1	1	1	9	4	2	27	3.21	3.87	4.97	
8	Reducing transaction time	9	1	1	1	9	7	4	33	3.48	4.95	5.00	
9	Reducing delivery time	1	1	9	9	4	7	7	40	3.48	5.42	4.62	
10	Alternative communication channel to customers	9	4	1	2	9	1	1	9	4.35	4.67	5.95	
11	Customer and market research facility	7	1	1	1	1	7	1	17	3.92	5.04	5.50	
12	Increasing services to customers	0	1	1	1	1	1	1	11	4.24	4.40	5.77	
13	Improving supplier relationships quality	9	1	1	1	1	9	9	27	3.89	5.77	5.06	
14	Enhancing perceived company image	0	1	1	1	1	1	2	7	4.70	4.19	6.29	
15	Organization learning and experiencing	7	7	2	1	1	4	4	13	3.70	3.67	5.16	
16	More accurate data for business partners	9	7	1	2	1	7	7	22	3.95	4.97	5.21	
17	Catching up and keeping in line with trends	4	4	2	1	1	1	1	18	4.38	5.15	5.49	
18	Realizing business strategies	4	2	1	1	1	1	9	6	3.97	3.81	5.37	
19	Leveraging business performance	7	1	2	9	1	1	2	20	3.55	4.3	5.14	
20	Gaining & sustaining competitive advantages	7	1	1	4	1	1	7	16	3.98	5.2	5.53	
21	Potential for increasing customer knowledge via interaction	4	9	2	1	1	1	4	12	3.89	3.66	5.85	

Similar with cost factors analysis, a set of hypotheses about the relationships between benefits and customer satisfaction were designed and tested. One of the hypotheses is 'the customer satisfaction is significantly dependent on "gaining competitive advantages"'. Here, 'Customer\_satisfaction' is defined as a dependent variable, and 'gain\_competitive\_advantages' as an independent variable, a one factor ANOVA model is shown in (2):

$$[customer\_satisfaction]_i = \alpha_i + [gain\_competitive\_advantages]_i + \varepsilon_i \quad (2)$$

The results (Table 5) indicate that customer satisfaction is significantly dependent on 'gaining competitive advantages' ( $p < 0.05$ ).

Table 5: ANOVA results with cell means for the effects on customer satisfaction

	Groups	Count	Average	Variance	Source of Variation	F	P-value
Gaining & sustaining competitive advantages (benefit factor 20)	1	3	3.666667	1.333333	Between Groups	2.429397	0.044857
	2	8	3.5	1.428571			
	3	8	2.625	0.839286			
	4	7	2.857143	1.47619			
	5	7	2.285714	0.571429			
	6	7	2.142857	0.809524			
	7	3	1.666667	0.333333			

Reducing costs is generally considered as one of the most important benefits being brought about by Internet technology. They can be achieved at a minimal investment to the organizations. For example, by shifting the majority of their functions online, organizations can reap tremendous savings in facilities and capital expenditure. However, relevant items (factor 5, 6, 7) were not given an obviously high weight from the sample companies. Enhancing perceived company image (factor 14) received a highest weight.

These benefit factors have a strong internal correlation. For example, E-business applications that can automate the business process would result in better communication (factor 10) and reduce the service costs of the organization (factor 5, 6, 7). Similarly, online product buying/selling would improve the service to the customers/suppliers (factor 12, 13) and result in better communication and streamline the corresponding business processes.

## FINDINGS AND CONCLUSIONS

Electronic commerce is about building better relationships among customer, producers, and suppliers. Traditional information systems are applied primarily to internal employees, E-business applications are connecting directly to critical business constituencies: customers, employees and business partners via Intranets, Extranets, and the Web. Therefore customer satisfaction has become a criterion to measure E-business application success. E-business suppliers have been aware that while an E-business application can be technically successful and meets its financial objectives, it can still be considered a failure if their customers are unhappy with the result.

The results show that the benefits factors of E-business applications are significantly correlated with customer satisfaction and the judgment on the quality of service has been shifted from the business to the individual customer. So the communication with customers becomes more important for businesses and needs to be refined (Amor 1999). In order to improve customer satisfaction, customer-centric E-business marketing strategy should be developed. For example, business can identify their customers in order to understand the buying patterns for every single customer and offer their customers automated assistance by pre-selecting goods, information and services that may be valuable to a particular customer. Today, customers have many means of communicating with a certain company. The customer information needs to be brought together into a database of customer profiles. It will support the company focus on the customer relationships.

The results also clearly indicate that improving customer satisfaction will make it easier and better to do business. A business needs to view their online applications from the customer point of view. Much like other IS applications the first step in determining success measurements for an E-business application is to define the application's requirements and expectations. Some companies in the sample didn't obtain 'very satisfied' response from customers due to ill-defined requirements that did not meet the expectations of customers. Therefore it is necessary for businesses to get enough feedback of customer experiences to clearly define their expectations and requirements. This includes a design of the appropriate online experience for its customers and to know better the needs of its customers. This will prepare a business for two diverse sets of E-businesses success: internal users and customers.

This research explores E-business application assessment from two sides: the businesses and customers, and discusses the relationships between cost/benefit factors and customer satisfaction. The results can be applied to plan quality improvements and launch E-business applications to assist in obtaining insights on the real costs/benefits of E-business investment for small and medium business. Particularly, it can be used to companies that already implemented E-business solutions but want to evaluate their applications.

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# Use of the Web for Destination Marketing in Regional Tourism

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## ABSTRACT

*The information-intensive nature of the tourism industry suggests an important role for Web technology in the promotion and marketing of destinations. This paper evaluates the level of Web site development in New Zealand's Regional Tourism Organisations, and compares them to their Australian counterparts. The study uses the extended Model of Internet Commerce Adoption (Burgess and Cooper 2000), and highlights the utility of using interactivity to evaluate the relative maturity of commercial Web sites.*

*Keywords: Electronic commerce adoption, Tourism, Destination marketing*

## INTRODUCTION

Conventional wisdom contends that business Web site development typically begins simply and evolves over time with the addition of features as the site takes on more functionality and complexity (e.g. MED 2000). Past empirical research of commercial web sites support this notion, contending that firms imitate what others do on the Web, partially in a desire to keep pace with competitors or to gain an advantage over competitors in ones own industry by replicating what firms have done in other industries (Sumner and Klepper 1998), or build expertise in electronic commerce through progressive experience with Internet technologies (Poon and Swatman 1999, Van Slykc 2000). Academic enquiry into this evolutionary process followed by firms is gaining momentum, and a number of benchmarking studies have evaluated the extent of Web site development in particular industry sectors of New Zealand (e.g. Rachman and Richins 1997, Smith 2001).

This paper reports the results of a study of Web site development in New Zealand's tourism industry. Tourism is an unusual product, in that it does not exist when it is purchased. Tourism exists only as information at the point of sale, and cannot be sampled before the purchase decision is made (WTO Business Council 1999). The information-based nature of this product means that the Internet, which offers global reach and multimedia capability, is an increasingly important means of promoting and distributing tourism services (cf. Walle 1996).

The Internet is a potentially significant means of promotion and destination marketing for New Zealand's tourism industry. New Zealand's top four markets for international visitors are Australia, UK, USA and Japan (Tourism Strategy Group 2001). The latter three, together with Germany (another important market for New Zealand), are the top tourism spenders in the world and also account for about 80% of the world's Internet users (WTO Business Council 1999). No wonder that New Zealand's "Tourism Strategy 2010" suggests that tourism should be able to secure significant lifts in performance through the application of technology such as the Internet. The document identifies Web sites as a way of in destination branding and marketing: "Consistent and reliable web information is an important part of attracting visitors and meeting their expectations" (Tourism Strategy Group 2001: 53).

Tourism is one of New Zealand's most important industries in terms of economic contribution. An \$11.5 billion industry, it is responsible for 1 in 10 jobs and is the country's largest export earner. Within the industry there are a small number of publicly listed companies and an estimated 18,000 small to medium enterprises (SMEs), about 80% of which employ less than 5 people (Tourism Strategy Group 2001). The tourism industry provides a wide variety of products and services, including adventure tourism, culture and heritage, transport, accommodation, retail and hospitality. Regional destination marketing organisations called Regional Tourism Organisations (RTOs) form part of the industry structure, and it is these organisations that are the focus of the current study. RTOs form an important layer between central government and the local tourism industry, potentially providing a coordinated and comprehensive marketing effort, and acting as a portal for visitor access to tourism operators and service providers.

The purpose of this study is to evaluate the extent of Web site development in New Zealand's RTOs. This evaluation is achieved using an Internet commerce adoption metric developed by Burgess and Cooper (2000) in a study of the Australian regional tourism industry, the extended Model of Internet Commerce Adoption (eMICA). The Web sites of 26 New Zealand RTOs were evaluated using the eMICA model. Secondary objectives of the study were (1) evaluating the validity of the extended MICA as proposed in the Australian study in a different national context, and (2) contributing to a comparative study across the two countries.

The structure of the paper is as follows. First the eMICA model used in the study is described. Next, the role of RTOs in the New Zealand tourism industry is discussed, and the results of the study are reported. A discussion of the results and the importance of Web site interactivity are then followed by some concluding remarks.

## THE EXTENDED MODEL OF INTERNET COMMERCE ADOPTION

The Model of Internet Commerce Adoption (MICA) was originally developed for a study in the Australian metal fabrication industry (Burgess and Cooper 1998). The model proposes that in developing commercial web sites, organisations typically start simply by establishing a presence on the Web and build on functionality over time, as their expertise in the use of Internet technologies increases. In addition, as Web sites build on complexity, so will the number of modules incorporated into the site increase. MICA consists of three stages, incorporating three levels of business process – Web-based promotion, provision of information and services, and transaction processing. The three levels of business processes are similar to those proposed by Ho (1997) and Liu et al. (1997). The stages of development provide a roadmap that indicates where a business or industry sector is in its development of Internet commerce applications.

As sites move through the stages of development from inception (promotion) through consolidation (provision) to maturity (processing), layers of complexity and functionality are added to the site. This addition of layers is synonymous with the business moving from a static Internet presence through increasing levels of interactivity to a dynamic site incorporating value chain integration and innovative applications to add value through information management and rich functionality (Timmers 1998). Since the original study, MICA has been applied to the government sector (Boon 1999) and tourism industry (Burgess and Cooper 2000) in Australia, resulting in its enhancement as an extended Model of Internet Commerce Adoption (eMICA). The central tenet of the extended model is that while businesses develop Internet commerce applications in stages as proposed by the original version of MICA, complexity and functionality vary greatly between applications, and even between businesses in an industry sector. In order to accommodate the wide range of Internet commerce development evidenced in industries such as tourism, the extended model proposes that a number of additional layers of complexity, ranging from very simple to highly sophisticated, exist within the identified main stages of MICA. The full eMICA model is summarised in Table 1 below.

**Table 1: The extended Model of Internet Commerce Adoption (eMICA)**  
(Adapted from Burgess and Cooper, 2000)

eMIC	Examples of functionality
Stage 1 - Promotion Layer 1 – basic information Layer 2 – rich information	company name, physical address and contact details, area of business annual report, email contact, information on company activities
Stage 2 - Provision Layer 1 – low level interactivity Layer 2 – medium interactivity Layer 3 – high interactivity	basic product catalogue, hyperlinks to further information, online enquiry form higher-level product catalogues, customer support (e.g. FAQs, sitemaps), industry-specific value-added features chat room, discussion forum, multimedia, newsletters or updates by email
Stage 3 - Processing	secure online transactions, order status and tracking, interaction with corporate servers

## NEW ZEALAND REGIONAL TOURISM ORGANISATIONS

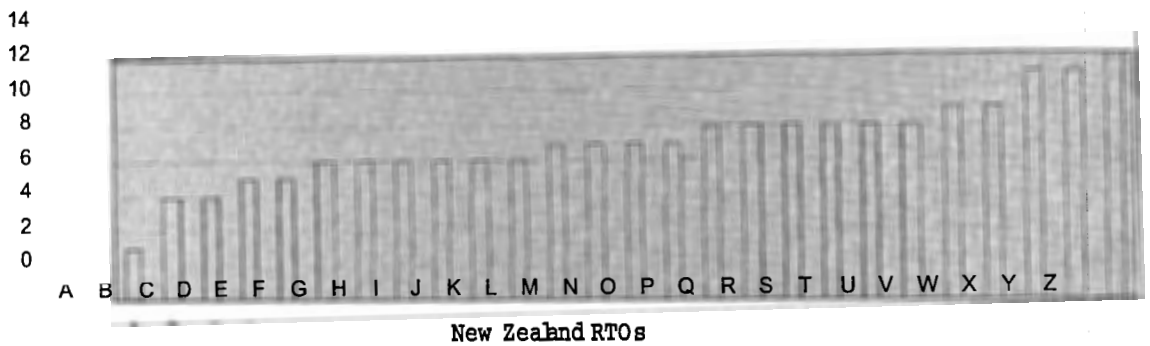
Tourism is a fragmented industry (Gretzel et al. 2000), and tourism promotion in New Zealand is a complex web of national, regional and local institutions frequently influenced by politics and personalities (Ryan 2001). At the national level, Tourism New Zealand receives about NZ\$55 million for the marketing and promotion of the brand "New Zealand". Tourism New Zealand's strategy is largely Web-based, its "100% Pure New Zealand" theme acting as a portal ([www.purenz.com](http://www.purenz.com)) to various types of experiences (Ryan 2001). At the regional level, New Zealand has 26 Regional Tourism Organisations (RTOs). These are geographically-based destination marketing organisations, responsible for promoting the various regions of New Zealand domestically and internationally. RTOs have a role to play in providing comprehensive coverage of products and services in their region, irrespective of whether individual service operators have an independent online presence (Sharma et al. 2000). Within each region, tourism promotion is less structured, with many districts, towns and cities having Web sites that market tourism features to varying extents. In addition, there exists a Visitor Information Network that comprises 130 information offices throughout New Zealand. These offices provide tourist information to international and domestic visitors, and some maintain their own Web sites.



RTOs play a major role in destination marketing, pooling the marketing resources of both public and private sectors to achieve a coordinated effect, and providing a link between Tourism New Zealand, local tourism operators and visitors to the region (cf. Gretzel et al. 2000). New Zealand's "Tourism Strategy 2010" envisages RTOs taking an enhanced role in domestic and international marketing, destination management, regional tourism planning and development, and facilitating provision of services to tourism operators in the near future (Tourism Strategy Group 2001). It is estimated that the aggregate budget of all RTOs is approximately NZ\$25 million, although staffing and resources varies widely given their dependence on support from the local authorities and private sector in their region (Ryan 2001). Gretzel et al. (2000) note that destination marketing organisations, like New Zealand's RTOs, often struggle with limited financial and human resources, and a lack of technical expertise.

All 26 New Zealand RTOs have established a Web presence, and a list of the RTOs with links to their Web sites was obtained from the Tourism Industry Association of New Zealand's Web site (<http://www.tianz.org.nz/tia/tia01.htm#rto>). Each RTO link was verified, and the 26 Web sites were evaluated during May 2001. Each site was examined in detail and the various functions performed by the site were noted in a spreadsheet file. The functions and features across all the sites were then grouped according to their level of interactivity and sophistication. Each RTO site was matched against this ordered list, the results of which are shown below in Figure 1.

**Figure 1: Functionality of 26 New Zealand Regional Tourism Organisations**



KEY: Level of functionality
1. Email contact details
2. Images
3. Description of regional tourism features
4. Systematic links to further information
5. Multiple value-added features ( key facts, maps, itineraries, directions, distances, news, photo gallery)
6. Lists of accommodation, attractions, activities, events with contact details and/or links
7. Web-based inquiry or order form
8. Interactive value-added features (currency converters, electronic postcards, interactive maps, downloadable materials, special offers, guest books, Web cam)
9. Online customer support (FAQs, site map, site search engine)
10. Searchable databases for accommodation, attractions, activities, dining, shopping, events
11. Online bookings for accommodation, tours, travel
12. Advanced value-added features (multi-language support, multimedia, email updates)
13. Unsecured online payment
14. Secure online payment

## EVALUATING THE RESULTS

Each RTO site was then assigned an appropriate stage and layer in eMICA based on the level of development of the site. The resulting data set was checked against the Australian regional tourism sites studied by Burgess and Cooper (2000), to maintain comparability of the results. A site needed to display functionality up to at least level 4 to be classified as Stage 2 of eMICA. Sites reaching level 8 functionality were classified as Stage 2, Layer 2, and those reaching level 11 functionality were classified as Stage 2, Layer 3. To be classified as Stage 3 of eMICA, a site required functionality at level 14. The results of the New Zealand study are shown below in Table 2, together with the equivalent figures from the Australian study (of 188 identified Australian RTO sites, Burgess and Cooper were able to evaluate 145).

Table 2: Results of the New Zealand RTO sites evaluated

Stage of eMICA		Number of sites	% of total sites	% of Australian sites evaluated by Burgess and Cooper (2000)
Stage 1	Layer 1	0	-	4.1%
	<b>LAYER 2</b>	1	3.8%	4.1%
Stage 2	<b>LAYER 1</b>	8	30.8%	36.6%
	<b>LAYER 2</b>	12	46.2%	40.0%
	<b>LAYER 3</b>	4	15.4%	15.2%
Stage 3		1	3.8%	0.7%
Total		26	100%	100%

The majority of the New Zealand RTO sites were developed to Stage 2 of eMICA, and incorporated the standard functional attributes of the first stage of development, such as email contact details, the use of photographic images, and a description of regional tourism features. However, the level of functionality and sophistication varied greatly across the three levels comprising this second stage of development, as discussed below. One RTO site was categorised as developed to Stage 1, Layer 2 of eMICA. This site was basically a single-page description of regional tourism features, but displayed limited evidence of higher interactivity in the form of a small number of unorganised links to external sites and maps. At the other end of the model, only one of the sites evaluated was developed to Stage 3, with the capability of offering secure online credit card payment for accommodation and travel bookings.

The major differentiation in the New Zealand RTO sites lay within Stage 2 of the eMICA model. Those sites located within the first layer of Stage 2 had some form of navigation structure such as buttons with links to different parts of the site. They had numerous internal and external links to further information, and incorporated value-added features characteristic of the tourism industry such as key facts (on location, climate, weather and services), maps, itineraries, news and media releases, and a photo gallery. Often, there would also be a more interactive feature such as a currency converter or a Web-based contact form. These sites also contained information on accommodation, attractions, activities and events in the region, usually in the form of a list organised by category and with contact details and/or links to the third-party operator (where available). Some of these lists appeared to be database-driven using technology such as "active server pages" (ASP). At Layer 2 of Stage 2, the value-added tourism features became increasingly interactive, and included electronic postcards, interactive maps, downloadable materials, special offers, guest books, and the use of Web cams. Sites at this layer incorporated some form of online customer support, such as FAQs, a site map or an internal site search engine. User interaction also included the use of Web-based enquiry or order forms. Information on accommodation, attractions, activities, dining, shopping, and events was provided via searchable databases, with searches available by type and/or location within the region. As sites progressed to Layer 3, the key feature was the facility to accept online bookings for accommodation, tours and travel. Two of these sites offered unsecure online payment of booking deposits by credit card. One of the sites had advanced value-added features that

included multi-language support, multimedia, newsletter updates by email, streaming video, and a QuickTime virtual tour.

Comparing the results of the New Zealand RTO Web site evaluations with the Australian study, we find a good level of consistency. In both cases, most of the organisations in this industry sector are at a relatively advanced stage of adoption of Internet commerce. The majority have incorporated various levels of functionality consistent with the three layers identified at Stage 2 of eMICA. This is consistent with the focus of this industry sector on tourism promotion and the provision of information and services that enable potential tourists to the regions to make informed travel decisions and choices.

## DISCUSSION

The information-intensive nature of the tourism industry fits particularly well with interactive media like the Web, and indications are that tourism Web sites are constantly being made more interactive (Goodrich 2000a, Gretzel et al. 2000, Hanna and Millar 1997, Marcussen 1997, WTO Business Council 1999). Moving from simply broadcasting information to letting consumers interact with the Web site content allows the tourism organisation to engage consumers' interest and participation, increasing the likelihood that they will return to the site, to capture information about their preferences, and to use that information to provide personalised communication and services. The content of tourism destination Web sites is particularly important because it directly influences the perceived image of the destination and creates a virtual experience for the consumer. This experience is greatly enhanced when Web sites offer interactivity (Cano and Prentice 1998, Gretzel et al. 2000, Legohérel et al. 2000).

Interactive Web site presentation runs a spectrum from information provision, through brochure ordering and inquiry services, to booking and payment online (Marcussen 1997). A summary of the key features of 25 "best practice" destination marketing organisations, evaluated by the World Tourism Organization, is presented by Goodrich (2000b). These features included navigational assistance and branding on the home page, multiple means of communication (including the use of colour, photographs, maps, symbols, and multimedia), interactivity, rich information on a wide range of topics, the use of managed and updated databases, and multilingual support. Standing and Vasudavan (1999) used a similar list of functions in their evaluation of Australian travel agents' Web sites. Their features included provision of product, service and destination information, transaction capability, customer interaction and feedback, and links to value-added information sources. Although Standing and Vasudavan were evaluating travel agencies, it is interesting to note that relatively few sites provided higher levels of interactivity such as online booking, payment and customer service.

The Web sites of the New Zealand RTOs display the same range of functionality as these earlier studies, and can be distinguished on the basis of the level of interactivity they offer to the consumer of tourism information and services. In fact, the eMICA model uses interactivity as the primary means of establishing the various stages of Internet commerce adoption. This study confirms the usefulness of Web site interactivity for this purpose. The results of the study suggest that in the tourism industry, major milestones in Internet commerce development are: moving beyond a basic Web page with an email contact, to providing links to value-added tourism information and the use of Web-based forms for customer interaction; offering opportunities for the consumer to interact with the Web site through (a) value-added features such as sending electronic postcards or recording their experiences and reading others' experiences in Web-based guest books, and (b) the provision of online customer support via internal site search engines and searchable databases; the beginnings of Internet commerce transactions with the acceptance of online bookings for accommodation, travel, and other tourism services; full adoption of Internet commerce, where consumers are able to complete transactions online through secure Internet channels.

Only one of the New Zealand RTO sites displayed interactivity at this last transactional level. Perhaps, as Burgess and Cooper (2000) note, this is not an unusual finding, given that the organisations in this industry sector are in the business of promoting regions and their unique features and offerings primarily through the provision of value-added information and services. Further adoption of Internet commerce is likely to depend on the future role taken by RTOs in New Zealand (Tourism Strategy Group 2001). However, this development may well occur on the supply side in facilitating the provision of services to tourism operators in their region, or in coordinating efforts between alliances of RTOs with perceived common interests. This would involve the deployment of more sophisticated Internet and Web technologies, such as intranets, extranets, electronic marketplaces and even mobile portals, consistent with the shift in emphasis from business-to-consumer electronic commerce to business-to-business electronic commerce observed in other sectors of the economy (Kalakota and Robinson, 2001).

## CONCLUSION

This paper has evaluated the Web sites of the 26 New Zealand Regional Tourism Organisations. The RTOs generally displayed a high level of interactivity, consistent with their role in providing comprehensive destination marketing for geographic regions in which many local tourism operators lack an Internet presence. However, almost all the RTOs stopped short of offering consumers the capability to complete their tourism and travel transactions online. Progression beyond this point is likely to depend on the overall maturing of Internet commerce use by domestic and international consumers, or a change in the role of RTOs as envisaged in the New Zealand Tourism Strategy 2010 (Tourism Strategy Group 2001).

The outcome of the research is a useful confirmation of the staged approach to development of commercial Web sites proposed by the extended Model of Internet Commerce (eMICA). Further, the comparative results of the New Zealand and Australian studies suggest that regional tourism organisations in both countries are at a similar, relatively sophisticated stage of development on the Internet commerce roadmap.

Future comparative research on an international level would help assess the "Net-readiness" of the tourism industry globally. In addition, the link between tourism spending and high Internet usage alluded to in this paper needs further research to establish whether a relationship between the two does in fact exist.

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# Product Option Choice Decisions and the Influence of Framing: an E-commerce Example

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## ABSTRACT

*The literature suggests that alternative portrayals of a decision problem may give rise to different consumption consequences, contrary to the rational theory of choice. The author examines the effects of using an additive versus subtractive option framing method on consumer choice in two markets increasingly facilitated by e-commerce.*

*Key words: Bounded rationality, Decision making, Framing, Loss aversion, Reference dependence*

## INTRODUCTION

One view of the rise of electronic commerce suggests that consumers will be empowered by access to more competitive markets and larger amounts of product and price information. They will benefit from greater control over information (to search for better products at lower prices) and reduced search costs associated with finding and comparing alternatives. In other words, e-commerce has the potential to reduce market failure associated with imperfect information.

The suggested revolutionary power of the on-line commerce environment is, however, tempered by the introduction of psychological considerations. One example is framing, illustrated by the joke about two priests and a bishop. One asks whether he can smoke while praying; the other asks if he can pray while smoking – you can guess which one received an affirmative answer. The way in which information is framed depends upon the language of presentation, the context in which the choice is to be made, and on the way in which information is displayed.

In this paper, I conduct an on-line experiment which attempts to verify how the way in which information is framed causes consumers to violate the principles of invariance and dominance associated with the utility maximisation paradigm in economics. Empirical validation of the effect of option framing on consumer choice in computer based decision environments is desirable from a managerial perspective in the development of strategies regarding the on line positioning and pricing of products; the ability to use price discrimination techniques and so on. There are also consumer welfare issues associated with framing.

## THEORETICAL BACKGROUND – BOUNDED RATIONALITY AND FRAMING

From the economic point of view, there is no reason to suspect that the theory of choice which applies in the physical goods market should not apply in computer assisted decision environments. In the utility maximisation paradigm, decision makers in riskless environments are assumed to be completely rational, fully informed about the possible courses of action and their consequences, and infinitely sensitive to differences in alternatives. Decision makers faced with uncertainty or risk would maximise expected utility after adjusting for the probability of an event. In this paradigm, decisions would always have an optimal outcome. But most consumers are not rocket scientists! Simon (1955) argued that actual decision making behaviour is better explained in terms of 'bounded rationality'. A boundedly rational decision maker attempts to attain a satisfactory (not necessary maximal) outcome. Simon labelled this 'satisficing'.

Essentially, normative economic theory focuses on the rationality of outcomes, whereas the information processing view that developed as a result of Simon's work and the involvement of other disciplines, such as psychology, aimed to understand process rationality. This branch of economics has come to be known as 'behavioural economics'.

Many behavioural studies report systematic errors (biases) in the mental tasks associated with decision making. This is so even on tasks which are relatively simple in comparison with many real world economic decisions. According to Conlisk (1996) psychologists hypothesise that agents make these systematic errors because they use decision heuristics (discovery aids or rules of thumb) which do not accommodate the full logic of a decision (due to incomplete information, insufficient processing power and so on). This recognises that most consumers are boundedly rational and cannot cope with the complexities that utility maximisation would imply. Consumers have limited capacity to receive, process, store and retrieve information. They are, therefore, not only constrained by their budget, but by their inability to make optimal choices.

One type of systematic error which has been reported in several studies (see, for example, the review article by Conlisk, 1996) is how the frame of reference influences consumer perception and judgement. Framing manipulations influence both the salience of the good, and the significance of gains or losses (Bettman et al, 1998). People tend to accept the frame presented in a problem and evaluate options in terms of a reference point suggested by that frame.

Framing is controlled by norms, habits and expectancies of the decision maker. Of interest in markets for information goods is that it is also controlled by the manner in which information is presented. According to Tversky and Kahneman, (1987, p.73) 'failures of invariance are explained by framing effects that control the representation of options, in conjunction with nonlinearities of value and belief'. In effect, the framing effect suggests that people choose between descriptions of alternatives rather than the alternatives themselves.

Because framing effects and their associated failures are ubiquitous, no adequate description of consumer behaviour can ignore this phenomenon. Puto (1987) provides a conceptual framework of the buying decision framing process. The human perceptual apparatus, he says, is tuned to an evaluation of changes or differences rather than the evaluation of absolute magnitudes. Two examples would be 'heat' and 'brightness', where judgement is by comparison with recent experience rather than against an absolute measure. The past and present context of experience thus defines a reference point against which new stimuli are judged. Outcomes are coded as gains or losses relative to some reference point (more or less; gains or losses)

Tversky and Kahneman (1987) illustrate this using an S shaped value function which has two main properties. Firstly, the S shape reflects the diminishing effect of a marginal change in gains or losses, so it is concave above the reference point (gains) and convex below it (losses). Secondly, the slope of the value function is steeper for losses than for gains. This is described as 'loss aversion' – the response to losses is more extreme than the response to gains.

Thaler (1985) illustrates loss aversion by reference to the perceptual difference between surcharges and discounts, noting that it is easier for the consumer to forego a discount than accept a surcharge because the same price difference is valued as a gain in the former case and a loss in the latter case. Tversky and Kahneman (1986, p. 77) cite another example – 'the credit card lobby is said to insist that any price difference between cash and card purchases should be labelled a cash discount rather than a credit surcharge'.



## THE EXPERIMENT

Two products were chosen for inclusion in this study – film processing and comprehensive motor vehicle insurance. These services were chosen because many firms use the Internet to provide consumers with information about these products and associated options; enable consumers to obtain quotes for various price / quality combinations; and enable consumers to enter into contracts for sale.

Following Park et al, (2000) product information was framed by asking respondents to add desired product options to a 'base model', or delete undesired options from a 'fully loaded' model.

Five hypotheses are tested.

**Hypothesis 1:** Consumers will choose more options in the subtractive options framework than the additive options framework. For many goods, the task of selecting options is an important part of consumer decision making. Managers can frame information in such a way that it asks consumers to add desired product options to a base level product, or delete undesired options from a fully loaded product. In the first instance, choice of options is guided by anticipated gains in utility at the expense of loss of monetary resources. In the second, option choice is a trade off between the anticipated loss of utility, and the lower price paid. In other words, consumers will use the price to which they are first exposed as an 'anchor'.

**Hypothesis 2:** Lower option prices increase the number of options selected in the additive options framework in comparison to the full price options. I test whether any significant difference in the number of options chosen under each frame is modified if the prices of options are a smaller proportion of the overall cost.

I also anticipate that the two option framing methods will elicit different psychological reactions from consumers, and will test three related hypotheses.

**Hypothesis 3:** Overall, the perceived value of the final chosen bundle is higher in subtractive options framework than additive options framework

I predict that option framing may affect consumers' perceptions of the bundle they ultimately select. If consumers delete less options under a subtractive options framework than they add to the base model in an additive options framework, this suggests that they perceive the products under subtractive options framework as offering more utility.

**Hypothesis 4:** Decision difficulty is greater in subtractive options framework than additive options framework. I predict that consumers engaged in subtractive options framework will perceive the task of making option choices more difficult than those engaged in additive options framework. In the subtractive options framework, the trade off is utility loss vs monetary gain. In the additive options framework, the trade off is utility gain vs monetary loss. If so, this is consistent with the S shaped value function described by Tversky and Kahneman (1987). If decision difficulty is influenced by framing, we would also expect the length of time which respondents report for making their decision to be higher in the option deletion frame. Thus there is a final hypothesis.

**Hypothesis 5:** Consumers take more time to make a decision in subtractive options framework than additive options framework .

Students (both undergraduate and postgraduate) at two Western Australian universities participated in the study. No remuneration or incentives were offered for participation. Eight web pages, each specifying an 'offer', were established to deliver information to respondents and collect responses. To manipulate option framing, subjects were assigned cyclically to one of the offers. Offers 1-4 were for film processing; offers 5-8 concerned car insurance. Offers 1, 3, 5 and 7 offered subjects the chance to add options to a base model, with options in offers 3 and 7 being half the price of their full price counterparts. Similarly, offers 2, 4, 6 and 8 gave participants the chance to delete options from a fully loaded model. Offers 2 and 6 were for full price options.

In each case, subjects were asked to assume that they had formed a definite intention to purchase the reference product (either the base level product in additive options framework or the fully loaded product in subtractive options framework). Subjects could then choose to add/delete options in each offer. In the case of film processing these options consisted of a second set of prints, replacement film, additional delivery of processed

film on CD, additional delivery via a web page accessed by password, and a hypothetical software bundle consisting of a tool to make screensavers and e-jigsaws from the processed film. The motor vehicle insurance options consisted of an excess waiver, free windscreen replacement, 14 day car hire, agreed value option, and new car replacement option. A short description was given for each option, but respondents were not able to 'click through' to find any other information.

The list of product options was derived from information available on a range of commercial web sites which enable consumers to explore product characteristics / obtain quotations / conduct transactions relevant to these product choices. To confirm that these options were relevant to prospective student respondents, a pretest (n= 47) was conducted in which subjects were asked to rate the importance of a number of options (1 = not important, 7 = highly important). As there was no significant difference to suggest that any option was of less value than any other, the range of options was confirmed.

In addition to the decision making process involving their choice of options, subjects were asked to complete measures assessing a range of psychological reactions related to their decision making process. The six values were assessed on five-point semantic differential scales relating to their degree of price consciousness, their degree of value consciousness, the degree of enjoyment subjects experienced in choosing their options, the degree of difficulty they faced in choosing options, and a final rating as to 'value for money', which was intended as a way of interpreting the utility which consumers would derive from their final 'package' for either commodity.

Two open-ended questions completed the survey. The first referred to the perceived degree of riskiness in the choice process and the length of time taken to undertake the option choice part of the questionnaire. The second asked whether the subject's decision making would have been enhanced by the ability to click through to find more detail about each option.

**RESULTS**

**Table 1: Reports the descriptive data and one way ANOVA results relating to H1**

Table 1: Number of options chosen / frame					
Good/s	Frame	N	Mean	Std. Dev.	Variance
Both	AOF	29	1.76	0.99	0.975
Both	SOF	26	3.19	1.06	1.122
d.f = 1/53; F = 26.983; p<0.001					
Film processing	AOF	14	1.46	1.05	1.103
Film processing	SOF	13	3.09	1.04	1.091
d.f = 1/26; F = 14.416; p = 0.001					
Car insurance	AOF	15	2	1.02	1.21
Car insurance	SOF	13	3.23	1.23	1.26
d.f = 1/27; F = 8.348; p<0.05					
Note: AOF = additive options framework, SOF = subtractive options framework.					

Levene's test for homogeneity of variance is not significant (p<0.05). As expected, option framing significantly effected the number of options selected. Results are also shown for each of the two goods separately.

**Table 2: Reports the descriptive data and ANOVA results relating to H2. The null hypothesis could not be rejected, contrary to expectations**

Table 2: Number of options chosen / frame / price					
Price	Frame	N	Mean	Std. Dev.	Variance
Half	AOF	15	1.83	1.07	1.146
Half	SOF	13	3.31	1.07	1.146
Full	AOF	14	1.69	0.99	0.975
Full	SOF	13	3.07	1.06	1.122
d.f = 1/53; F = 2.348; p = 0.09					
Note: AOF = additive options framework, SOF = subtractive options framework.					

H3 predicted that option framing may affect consumers perceptions of the bundle they ultimately select. If consumers choose more options under subtractive options framework than additive options framework, this suggests that they perceive the products under subtractive options framework as offering more value.

**Table 4: Reports descriptive data and one way ANOVA results for H3. Again, the null hypothesis could not be rejected at the 5% level.**

Table 4: Perceived value / frame				
Frame	N	Mean value	Std. Dev.	Variance
additive options framework	29	3.31	1.04	1.091
subtractive options framework	26	3.81	0.80	0.642
d.f = 1/53; F = 3.341; p = 0.073				

Table 5 reports descriptive statistics and one way ANOVA results relating to H4. It was predicted that consumers engaged in choosing options under a subtractive options framework would perceive the task of making option choices more difficult than those engaged in additive options framework. In the subtractive options framework, the trade off is utility loss vs monetary gain. In the additive options framework, the trade off is utility gain vs monetary loss. As expected, the degree of difficulty which subjects report is higher for those making decisions under the subtractive options framework than for those adding options to the basic product (significant at the 0.05 level).

Table 5: Reported decision difficulty / frame				
Frame	N	Mean value	Std. Dev.	Variance
additive options	29	1.97	1.02	1.034

framework				
subtractive options framework	26	2.61	1.35	1.822
d.f = 1/53; F = 5.151; p = 0.027				

Finally, it was hypothesised (H5) that if decision difficulty is influenced by framing, there would be a significant difference between the time which respondents report for making their decision in each framework. The mean time taken by those using a subtractive options framework was 102 seconds, compared to 88 seconds for those using the additive framework. This was significant at the  $p < 0.1$  level. Interestingly, the relative difference in time taken under each frame for film processing was much higher than the time taken in each frame for motor vehicle insurance.

## DISCUSSION

The results of this experiment reveal interesting findings about the effects of option framing on consumer choice decisions for these goods.

As noted in Table 1, framing has a significant effect on option choice, although the confidence level for car insurance is lower. Logically, the end states for each frame were the same, but differences in descriptions and reference points associated with each frame caused very different outcomes. It is possible that this result reflects differences between the types of goods chosen for the survey. Zhang and Buda (1999) found that the message framing effect for low 'need for cognition' goods was more significant than was the case for high need for cognition goods. This may also be supported by the fact that the average response time by subjects choosing options for motor vehicle insurance was 141 seconds, as against 52 seconds for respondents choosing film development options. We could infer that insurance has a higher need for cognition than film processing, but the difference in 'processing' time could also be associated with the (student) subjects' level of experience in the film processing and car insurance markets. Perhaps film processing decisions might incorporate a learning effect as they are made several times per year and may be regarded more as search goods rather than experience goods. Motor vehicle insurance decisions, by contrast, are made less frequently, and may be subject to inertia as the cognitive load associated with change may outweigh the potential benefits of change.

The results associated with the subjects' reaction to the option choice process also bear out the predictions made in the literature. The significant difference in the difficulty the subjects felt in making decisions in both frames suggests that the loss aversion discussed previously applies for those committed to making a decision on the basis of the information available about the fully loaded model. The issue of commitment may be of interest. The high commitment which subjects were asked to assume may act as a boundary for the managerially positive effect of the subtractive options framework. This may be important in markets facilitated by e-commerce, as the literature indicates there is a high 'click through' rate on many web sites and a low conversion of visits to sales.

As noted in the results associated with H4, a subtractive options framework adds to both conceptual and monetary cost which would reduce the time and income available for other welfare enhancing activities. Questions might therefore be asked about consumer welfare in situations where managerial practice was to offer the fully loaded product as a default option, knowing that committed consumers would spend more on the product than might be the case if the base model was offered.

The picture painted in the introduction to this paper was of an efficient frictionless market which would increase consumer surplus. On the contrary, framing suggests an increase in producer surplus if consumer decisions can be manipulated by subtle elements of information and persuasion. A prominent feature of information goods is that they have large fixed costs of production and small variable costs of reproduction. According to Varian (1997) cost based pricing makes little sense in the information goods context. Value based pricing is more appropriate because consumers place different values on information goods.

Economists use the term 'price discrimination' to describe value based pricing. Varian describes how this is used in e-commerce under the label 'versioning'. The point of versioning is to get consumers to sort themselves into various groups according to their willingness to pay (i.e. self selection). To completely capture consumer surplus, the number of versions of a product should be equal to the number of types of consumers in the market.

The managerial implication of this, according to Varian (1997) is to design a product so it can be versioned. The modularisation that characterises many information goods (even physical ones such as books and CDs) makes it far easier to remove features than it is to add them.

## **FURTHER RESEARCH**

According to Conlisk (1996), Bettman et al (1998) and Tversky and Kahneman (1987), the theory of framing is as yet incomplete. This research yields several implications for further study. From a managerial perspective (marketing, product and information design), research into the differential effects of various framing cues might be undertaken. Another research implication concerns decision making from various types of good or service. Perhaps previous experience in making some types of decisions, or in making decisions for some types of goods reduces the framing effect. This refers to the notion of learning – whether experience enables people to make more optimal decisions.

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# Some Thoughts on Managing E-Commerce Risks

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## ABSTRACT

*This paper is concerned with the risks in e-commerce. The general e-commerce risks are identified and some risk management solutions are proposed and analysed. In particular, we show how to assess e-commerce risk exposures and we discuss the need of hedging and insuring e-commerce risks.*

*Key words: e-commerce, risks, risk map, risk management, insurance and hedging*

## INTRODUCTION

E-commerce i.e. electronic commerce can be loosely defined as 'doing business electronically', see e.g. Timmers(1998). E-commerce includes electronic trading of physical goods and intangibles such as information. This encompasses all the trading steps such as online marketing, ordering, payment, and support for delivery. Electronic commerce includes the electronic provision of services, such as after-sales support or online legal advice. Finally it also includes electronic support for collaboration between companies, such as collaborative design.

Some forms of electronic commerce exist already for over twenty years, e.g. electronic data interchange (EDI), in sectors such as retail and automotive and CALS (Computer Assisted Lifecycle Support) in sectors such as defence and heavy manufacturing.

These forms of e-commerce have been limited in their diffusion and take-up. In recent years, however, we see an explosive development in e-commerce. The reasons for that are, of course, the Internet and the World Wide Web, which are making e-commerce much more accessible. They offer easily useable and low cost forms of e-commerce. E-commerce on the basis of the Internet is set to become a very important way of doing business.

Although there is a downturn in the dot.com sector, E-commerce is continuing to emerge and develop. The risks associated with e-commerce are also becoming more and more important. Unlike the mature financial risk management, e-commerce risk management is at its early development stage. Without doubt, many ideas and principles from financial risk management will be useful for e-commerce risk management.

Unpredictable movements in exchange rates, interest rates, and commodity prices not only can affect a firm's reported earnings but even may determine whether a firm survives. Over the past two decades, firms have been increasingly challenged by such financial price risks. In response to these risks, a wide range of financial derivatives such as options, forwards, futures, swaps etc. have been introduced into the market and become available to manage these financial risks, see e.g. Chance (2001) and Smithson (1998). In contrast to the wide range of products designed for managing financial risks, to the author's best knowledge, there are hardly any financial products available designed for managing e-commerce risks and there are few insurance policies for e-commerce risks. Along with the rapid development of e-commerce, managing risks associated with e-commerce is becoming an important and critical issue.

In order to manage risks, a firm must know what risks it faces and how big they are. Consequently, the firm must implement a 'system' for measuring risk. This general rule does apply to e-commerce. In this paper, we attempt to identify the key risks in e-commerce and propose some solutions for managing them. In particular, we shed some lights on the further development of hedging and insuring e-commerce risks.

## **IDENTIFYING RISKS IN E-COMMERCE**

As e-commerce is still a relatively new form of commerce, the potential legal risks are very real. Failure to consider the complexities of old and new laws as they affect commercial activities on the Internet will reduce the income potential and increase tax liability and other legal risk of an e-commerce business. For a more detailed discussion on legal risks in e-commerce, we refer to Greif (2000). Here we are more concerned with the operation risks in e-commerce.

Some e-commerce risks are obvious. The current privacy and security fury on the web makes these risks hard to overlook. Privacy and security risks are clearly important issues for insurance and financial services. The gathering and exchange of large amounts of non-public personal consumer information makes these industries particularly vulnerable.

There are many additional risks in e-commerce. To consider the e-commerce risks for a firm, a systematic approach such as a checklist is necessary and useful. The following list categorises e-commerce risks as web site specific risks, commerce risks, intellectual property risks, security risks, downstream liability risks etc.

### **Web Site Specific Risks**

- Links and framing
- Meta tag abuse

### **Commerce Risks**

- Unfair trade practices and fraud
- Property damage
- Advertising violations
- Privacy of customer information
- Defective hardware and software
- Unfair competition and antitrust violations

### **Intellectual Property Risks**

- Domain name hijacking
- Copyright and trademark infringement
- Disclosure of trade secrets
- Online intellectual property infringement liabilities
- Defamation

### **Security Risks**

- Loss of web site
- Loss of credit data
- Loss of advertising and electronic funds
- Viruses
- Employee error
- Theft of information
- Modification of system or data
- Denial of service



## Downstream Liability Risks

Hacker damage to a company that results in the company damaging others  
Damage from within a company that results in the company damaging others

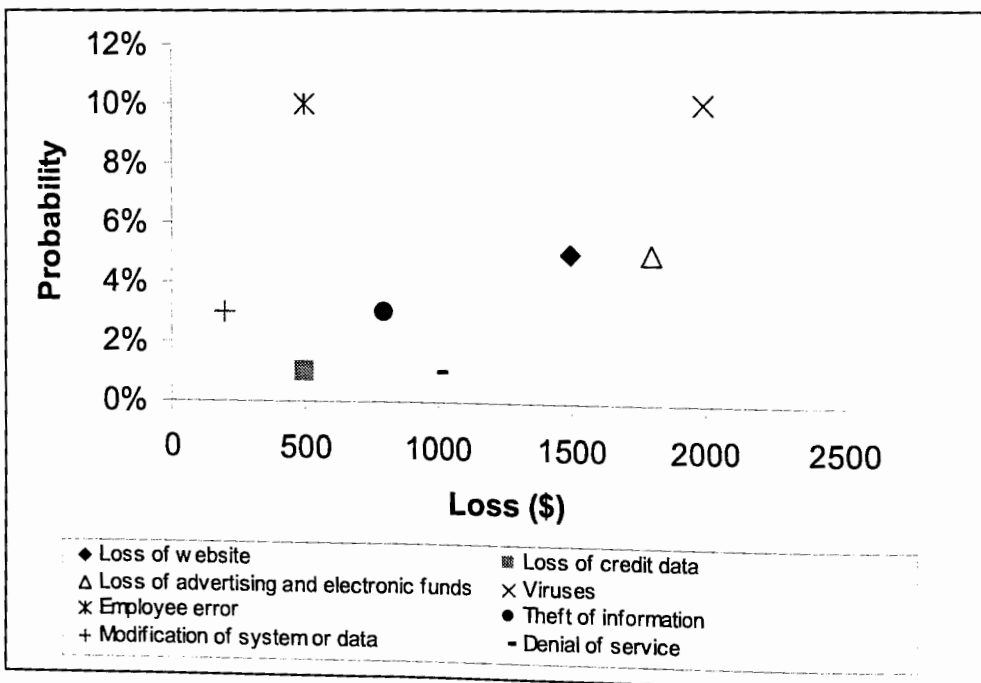
The triggers of the risks above may be hackers, fraud, virus, network crashes and other operational problems. All risks can be severe, some of them may be even fatal to a business. The importance of each risk may vary from business to business. To manage e-commerce risks, it is important to go through the above check list and be aware which are the key risks related to one's business. In the next two sections, we propose some solutions to manage these risks.

## SPECIFYING RISK EXPOSURE

Risk assessment involves a combination of a variety of formal and informal methods. It is practised in a variety of areas, by individuals with a wide spectrum of skills. Its goal is to determine the probabilities and impacts of various events. This data then can be used to provide guidance on the proper management of risks.

A significant risk assessment tool is a simple graph known as a risk map. A risk map is a two-dimensional chart that shows the probabilities on one axis and the consequences (losses) on the other.

Understanding the risks faced by an organisation begins with mapping the probability and consequence characteristics in a risk map. These numbers can come from a variety of sources. More formal methods involve the collection of statistics and the use of loss scenario analysis to calculate the probability of outcomes from those of underlying events. They are an expression of the analysts' intuitive understanding of the risks an organisation faces. A good example of how to use risk map in managing risk is given in Jablonowski (2001). As an illustration, the risk map for the security risks in a hypothetical e-commerce business is shown in Figure 1.



risk map

How risks are dealt with depends on where they fall on the risk map. Risks in the upper right quadrant of the map (e.g. the virus risk in Figure 1), those with high probability of severe consequences, represent serious danger to an organisation. They must be avoided, their probability and consequences reduced, or their effects transferred via some mechanism like insurance. The risk map provides a direct link between the analysis of risk exposures and the selection of techniques for dealing with these exposures.

The general risk assessment rules can be applied to e-commerce. In assessing the risks related to an e-commerce business, we need first to estimate the consequences associated with the risks. This may not be too hard to estimate in practice. Then we need to estimate the probabilities related to each risk. In practice, this may be hard and may not be accurate enough due to the shortage of historical data and comparison data. For a specific e-commerce business with sufficient historical data, we can use the historical data to predict the probabilities of the loss due to, for example, hackers in a specific period. Of course, such probability may be evolving overtime due to technology progress or changes in legal environment.

Armed with the information presented on the risk map, risk events can be modelled using simulation. Simulations are computer programs that use probability and loss information as inputs. They can be used to develop and test various risk management options in a realistic yet controlled environment. It is in this sense that the probability/loss analysis precedes that development of useful holistic risk management techniques. We need to know what we are up against before we can develop workable solutions.

## **INSURING AND HEDGING RISKS**

Given the nature of risks faced by an e-commerce business, it is impossible to eliminate all the risks totally. However, the risks can be reduced greatly if some proper risk-reduction measures are taken.

One way of mitigating the risks is to take insurance cover against eg. hackers, fraud, and network crashes etc. This method is rarely taken as it is very expensive to cover all the risks related to e-commerce so that the costs of insurance often outweigh the benefits. Besides, such insurance policies may not even exist. Thus an e-business firm often sets up a fund and self-insures, see Ferguson (1999). It is not an overnight process and insurance policies are being quickly developed in this aspect. Without doubt, the overblown fears in e-commerce will benefit the insurance industry and more insurance policies for e-commerce risks will be developed soon.

The hedging concept in financial risk management is relevant to managing e-commerce risks. In investments, hedging refers to buying an asset to reduce the risk in a portfolio. The term is common in futures and foreign exchange markets where traders use facilities available to protect themselves against future price or exchange rate variations. If someone bulk buys scotch whisky ahead of the budget in anticipation of a price rise in the budget, then he or she is hedging (provided the whisky is drunk—if it were bought to be sold, then the buyer is speculating).

To hedge e-commerce risks, we need to use some financial products such as a 'technology failure put option'. Under such an option, the buyer of the put option will receive some compensation payment if some technology risks strike. Thus such an option can offset some or all of the damage from those risks for the buyer's e-commerce business. But the buyer needs to pay a premium for having such a protection. Hedging essentially involves pooling the risks and trading them in the market place. Hedging does not eliminate any risks, rather it transfers risks to the market. The mechanism is quite similar to insurance. The only difference is that for hedging the risks are transferred to the market rather than the insurer. The benefit of hedging for an e-commerce firm is the reduction in e-commerce risks, typically as depicted in Figure 2. That is, by hedging, an e-commerce firm can have a more stable income.

The key advantage of hedging over insurance is that the financial products used for hedging are traded in the market and hedging position can be closed off easily by taking an opposite position in the option. Due to the need in hedging e-commerce risk, special derivatives products will be developed and available in the market. A good example is the recent endeavour by Enron Corp. to create a financial risk management market for advertising, see Clark (2001) for more details.

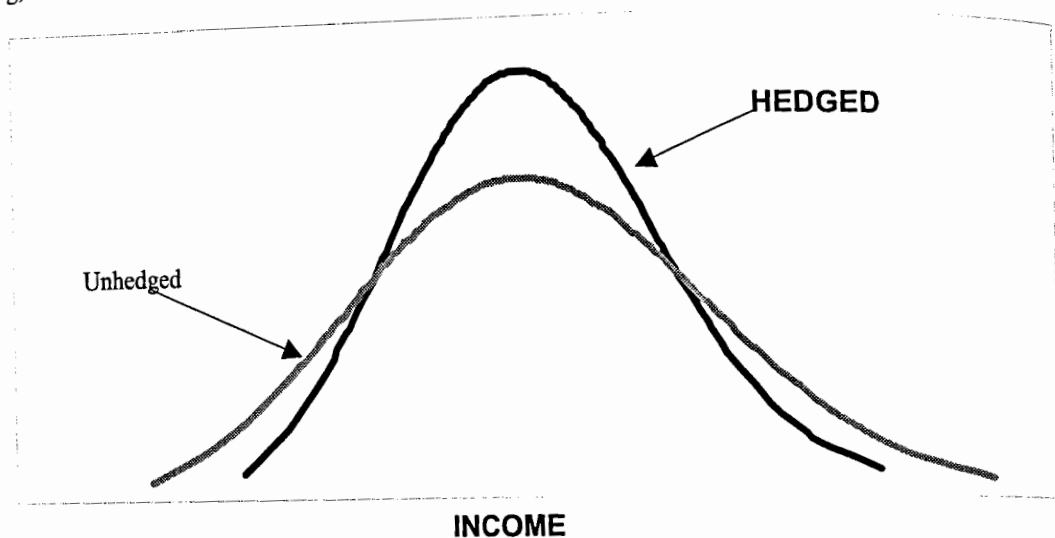


Figure 2: The effect of hedging

### SOME RISK MANAGEMENT POLICIES

Risks do exist with e-commerce as shown in the previous section. We have to live with them whether we like them or not. After the risk assessment, the next thing is to implement a set of risk management policies. Of course, risk management policies should be firm specific. The need of hedging or insuring will also vary from firm to firm. Nevertheless, there are some common characteristics with e-commerce firms that call for some common management policies. Some of the common rules are as follows.

Do not depend solely on firewalls. Firewalls help thwart external threats, but the integrity of your e-commerce system can also be jeopardised from inside your organisation, for example, it could be by a disgruntled employee

Design security into your e-commerce strategy. Security as an afterthought maximizes the odds of key systems gaps.

Install systems capable of handling volume spikes. Boosting the traffic capacity of your e-commerce and makes the web site less vulnerable to hackers attempting to flood it and shut it down,

Constantly probe for system weaknesses. Consider hiring friendly hackers to see how easy or difficult it is to infiltrate your computer system.

Create centralised responsibility for assessing and addressing system vulnerabilities. Choose one person, such as the chief information officer or IT manager, who will be accountable for assessing and fixing such system vulnerabilities.

Emphasise early detection and loss mitigation systems. Put software and personnel in place to detect problems early and to allocate resources that limit any damage to your e-commerce business.

Take legal action against attackers. Some companies and personnel are reluctant to take legal action because they fear that the publicity will hurt their bottom line. But legal action is the best way to deter future mischief.

Monitor continually and update your system. This will allow your firm to be at the forefront of fighting risks.

If necessary and available, insure or hedge your e-commerce risks.

The above list is definitely not exhaustive. Many more can be surely added to the list. It is necessary for one to take its own specific business situation into account and draw up a proper list of rules to follow. In short, good risk management policies are important and necessary for e-commerce risk management.

## CONCLUSIONS

E-commerce risks will become an important and critical issue along with the rapid development of e-commerce. Some major risks in e-commerce are addressed in this paper. In assessing the risk exposure of an e-commerce business, we recommend the use of a risk map. Risks such as Internet failure etc. can be effectively reduced by insurance or hedging, both are at early developing stage for the e-commerce sector. Some financial products are needed for effectively managing the e-commerce risks. We believe that such products will soon be developed and eventually will play an important role in the further development of e-commerce. Finally, we propose some e-commerce risk management policies which are common to e-commerce businesses.

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# Valuations of Dot.Coms: Some Implications from the Recent Market Plunge

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## ABSTRACT

*Internet companies have suffered a great loss in their market value recently, though their share prices were sky rocketing two years ago. This fact casts doubts on the credibility of the valuations of dot.coms and even the methods used in the valuations. This paper attempts to provide some analysis and insight to understanding these issues. The validity of the discounted cash flow models is addressed. The major difficulties in valuing dot.coms are discussed and some solutions are proposed to circumvent these difficulties. Finally, some valuation examples are presented to illustrate the key points in valuing dot.coms.*

*Keywords: Internet companies, dot.coms, valuation, discounted cash flow models, speculative bubbles.*

## INTRODUCTION

In early 2000, Internet entrepreneurs had succeeded in quickly transforming their business ideas into billion-dollar valuations that seemed to defy common wisdom about profits, multiples, and the short-term focus of capital markets. Valuing these high-growth, high-uncertainty, high-loss firms is a challenge. Some practitioners have even described it as hopeless. For example, Wang (1998) argued that the benchmarks can be elusive for valuing Internet companies.

Now the picture for Internet companies is totally different. Many Internet companies including those like AOL, Yahoo, eBay and Amazon with sound business models and experienced management have seen their values plummet. The days of easy money are gone. Unless your Internet startup falls into broadband, infrastructure, wireless, or optical networking plays, your ability to raise private equity or venture capital is negligible, as pointed out in Charterand (2001).

The abrupt fall of the Internet companies has cast many doubts on the credibility of the valuations of dot.coms done in the past. For example, Copeland et al. (2000) obtained an equity value of 23 billion for Amazon.com in 1999, that is, \$66 per share. Damodaran (2001) published a valuation of Amazon in March 2000 and valued its equity at 11.955 billion dollars, that is, \$35/share. On the other hand, the market price of Amazon was around \$98 in December 1999, \$26 in December 2000, and \$13 in June 2001. It is natural to ask if such valuations make sense and if so, to what extent can one rely on the valuation by analysts? In this paper, we attempt to address these problems where possible we shall use Amazon.com as an example to illustrate.

## TRADITIONAL APPROACH OF VALUATION

The value of any asset lies in its future economic benefits and thus is a function of the cash flows generated by that asset, the life of the asset, the expected growth in the cash flows and the risks associated with the cash flows. Typically, the discounted cash flow approach (DCF) is often used: value of an asset =  $\sum PV(\text{Cash Flows})$ , see e.g. or Brealey and Meyer (2000) and Palepu et al. (2000) for more details.

There are a number of ways to apply the discounted cash flow approach. The free cash flow (FCF) model is the most widely used in practice. The economic profit model is gaining in popularity. Its advantage is that it highlights whether a company is earning its cost of capital. It is important to point out that both models result in exactly the same value, so the choice is mostly driven by the instincts of the user. The adjusted present value model and the equity discounted cash flow method are particularly useful in special situations. For examples, the equity DCF model is best suited for financial institutions such as banks and companies. The APV model is helpful for valuing companies with changing capital structures, such as leveraged buyout targets. These two models also give the same result as the FCF model. The key for applying these models is forecasting the cash flows.

## THE VALIDITY OF THE DCF MODELS IN VALUING DOT.COMS

The DCF models are simpler when valuing firms with positive earnings, a long history of performance and a large number of comparable firms. However, Internet companies typically do not satisfy these conditions. High P/E ratio of Internet companies (300 or even higher) is out of proportion of any wild expectation. In particular, such high P/E ratio is usually associated with negative and declining profit of Internet companies due to the tendency of free provision of increasingly more Internet services. The economic mechanism of this phenomenon poses a great challenge to the traditional valuation approach. There are common difficulties in applying the valuation models to Internet companies (to be discussed later).

During the hey days of Internet companies, the prices of dot.coms were so high that many investors and analysts questioned the validity of traditional valuation approach for dot.coms. On the other hand, Many academics and specialists, see e.g. Copeland et al (2000), and Damodaran (2000), argued that the traditional approach with some modifications can be used to value dot.coms.

According to Shuttleworth (2000), some researchers confirmed that there was no correlation between an Internet company's bottom-line net income and its stock price. However, they did find that individual income statement line items, in particular gross profits (defined as gross revenue minus cost of revenue), did have an affect on prices. This implies that DCF models may well be relevant to the valuation of dot.coms.

The recent Internet market plunge has clearly demonstrated that most Internet companies were far overpriced in early 2000. This implies the gap between valuation results and market values of dot.coms was, to a great extent, due to the speculative bubbles. Thus DCF valuation results might be close to the 'true values' of the dot.coms and they did make sense.

By now, it should be clear to the public that Internet is no King Midas. Business ideas related with Internet must be analyzed with the same vigour as any other business initiatives. However, the credibility of each valuation is highly dependent to the validity of its assumptions. This certainly applies to valuing Internet companies. The same approach does apply on valuing dot.coms, though some adaptations may be necessary and such companies are typically more difficult to value than companies in the 'old economy'.

## COMMON DIFFICULTIES IN VALUING DOT.COMS

In applying the traditional approach, analysts often encounter three problems with dot.coms: Negative earnings, absence of historical data and absence of comparable firms, as discussed in Damodaran (2000).

The basic problem with valuing firms with negative earnings is that projections cannot be based upon a base number that is negative. There are three options available to an analyst valuing a firm with negative earnings: normalize earnings, revenue/margin projections, or adjust leverage. Besides, the tax computation becomes more complicated with such firms and the normal going-concern assumption may be invalid.

In valuation, we often use data from years prior to the current year to estimate inputs more precisely. Due to the lack of historical data for dot.coms, it is often hard to estimate the betas and other variables such as working capital which vary significantly from year to year.

In addition, analysts also use information on comparable firms frequently in valuation. Thus the betas of a firm may be estimated by looking at firms of similar size in the same business. Estimates of capital expenditure requirements and working capital needs are often based upon the averages for comparable firms in the same business.

In considering the last two problems, it should be noticed that these two sources of information – historical data on the firm being valued and contemporaneous data on comparable firms – can substitute for each other. In other words, valuing a firm with limited history can be made much easier by the presence of a significant number of established firms in the same line of business. To a lesser extent, having a long history of information on the firms in the same line of business may compensate for the absence of comparable firms.

Apart from these problems, the Internet industry is very volatile and at an early growth stage. Typically, the growth of dot.coms can vary enormously from year to year. For example, Amazon posted growth rates in revenues of 800% from 1996 to 1997 and then another 400% from 1997 to 1998, and has also made a transition from being a book retailer to a specialty retailer. Such instability in growth also adds extra difficulty in estimating the future revenues and cash flows.

In general, the value of any firm can be decomposed into two components: value of assets in place and value of growth potential. For Internet companies, almost all of the value can be attributed to the second component. Hence the firm value is almost completely determined by assumptions about the latter.

In short, it should be noted that valuations of dot.coms are always subject to much more uncertainties than for firms in the 'old economy'. Thus the valuation results for dot.coms should be taken as a rough estimate in most cases. This has been evidenced clearly by the recent market correction for Internet companies. As the Internet industry matures, the noise in valuation of dot.coms will become less and less.

## ASSUMPTIONS AND VALUATION EXAMPLES

In this section, we look at some valuation examples for Amazon.com and the relevant valuation assumptions. The purpose here is to highlight the major issues involved in valuing dot.coms. For this purpose, it is sufficient to base our discussions on valuations done by other people, rather than carrying out our own valuation.

## BACKGROUND OF AMAZON.COM

Amazon.com started to sell books on the Internet in July 1995. Its shares were first traded on the stock market in May 1997. Between May 1997 and December 1999, the value created by Amazon for its shareholders amounted to 34.56 billion dollars, which is equivalent to a period return of more than 7000%. This is in sharp contrast to the stock market (S&P500) yield of 61% during that period. However, its share price fell sharply in the past one and half years from its \$106.7/share quoted on 10 December 1999 and its share is trading at about \$13 only in June 2001.

In the one and half years from December 1999 to June 2001, the nature and structure of the business of Amazon.com did not change much. Thus the huge plummet of the share price of Amazon.com must be mainly due to market sentiment change, that is, speculative bubbles. The speculative bubbles are not a new phenomenon. An example is the railway bubbles. When the railways started building their lines, investors had tremendous expectations about these companies' future growth, which led to a dramatic increase in their share prices. However what happened afterwards with the railway business showed that the share prices had been overvalued: the companies return was much lower than expected. It seems to be fair to say that there were bubbles in the share prices of Amazon.com in early 2000. Now the bubbles have burst, but it is hard to tell that if there is still bubbles left or the company is being underpriced in the market. Estimating the real equity value of Amazon.com remains tough.

## VALUATION BY COPELAND ET AL. (2000)

As pointed out in Copeland et al. (2000), the best way of valuing Internet companies is to return to economic fundamentals with DCF approach, which makes the distinction between expensed and capitalised investment unimportant because accounting treatments do not affect cash flows. The absence of meaningful historical data and positive earnings to serve as the basis for price-to-earnings multiples also doesn't matter, because the DCF approach relies solely on forecasts of performance and can easily capture the worth of valuation creating businesses that have several years of initial losses.

The DCF approach cannot eliminate the need to make difficult forecast, but it does address the problems of ultra-high growth rates and uncertainty in a coherent way. Copeland et al. proposed to start from a fixed point in the future and working back to the present, using probability-weighted scenarios to address high uncertainty in an explicit way, and exploiting classical analytical techniques to understand the underlying economics of these companies and to forecast their future performance.

To be more specific, Copeland et al. (2000) estimated the value of Amazon.com by assuming scenarios for 10 years, ordered from most optimistic to least optimistic. Scenario A corresponds to 'suppose that Amazon is the next Wal-Mart', 15% of book sales on the American market, 18% of music sales of the American market, success in the sale of new products and a good margin. Scenario B and C are midway between A and the most pessimistic scenario (D), which is defined as much lower shares of the book and music markets, little success with other markets and a smaller margin. The value of Amazon's equity in 2000 is obtained as 79 billion dollars according to Scenario A and 3 billion according to Scenario D. These values are obtained by discounting the free cash flows. The next step is to allocate probability to each scenario: they assumed that 5% to the most optimistic, 25% to the most pessimistic and 35% to the midway scenarios. With these assumptions they obtained an equity value of \$23 billion, that is, \$66/share. The major results are summarised in Table1 below.



**Table 1: Copeland et al.'s forecast and valuation for Amazon.com**

	Sales in 2001 (\$billion)				Margin of EBITA (%)	Equity Value in 2000 (\$billion)	Probability (%)
	Books	Music	Other	Total			
Scenario A	24	13	48	85	14	79	5
Scenario B	20	9	31	60	11	37	35
Scenario C	16	6	19	41	8	15	35
Scenario D	7	5	5	17	7	3	25

It should be noted that the above offers only a rigorous description of what could happen. We can not credibly forecast 10 or more years of cash flows for a company like Amazon.com, neither can we tell the exact probabilities associated with each scenario. Besides, the number of scenarios may be far more than the four considered above and the bankruptcy is not allocated with any probabilities. The purpose of such an estimate offers a way to understand the value of Internet companies rather than a precise estimate of the value which is not attainable given the huge uncertainties involved.

With the benefit of hindsight, the above estimate shows that Amazon.com was overvalued as its share was trading at around \$100 dollars in early 2000. Thus such valuation does make sense if we take the subsequent abrupt fall of the share prices of Amazon.com into account! However, the credibility of this estimate is quite limited as the current share price of Amazon.com is trading far from the equity value obtained above. It is impossible to know what the real equity value of Amazon.com should be, but it appears to be reasonable to say that the company was far overpriced by the market in early 2000, mainly due to the market sentiment.

#### VALUATION BY DAMODARAN (2000)

Damodaran (2000) published a valuation of Amazon in March 2000 and valued its equity at 11.955 billion dollars, that is \$35/share. The valuation is a simple discount of the FCF at the weighted average cost of capital. From this quantity, the debt and the value of the options held by the employees are deducted to obtain equity's value. The major forecasts are listed in Table 2 below.

**Table2: Damodaran's forecasts & valuation of Amazon.com (in \$millions)**

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Sales	2793	5586	9776	1466	1906	2386	2873	3321	3680	3001
EBIT	-373	-94	407	1038	1628	2212	2768	3261	3646	3883
Taxes	0	0	0	167	570	774	969	1141	1276	1359
Depreciation	46	60	75	90	104	115	122	130	138	146
Capital expenditure	554	907	1345	1572	1438	1572	1599	1489	1226	815
WC expenditure	50	84	126	147	132	144	146	134	108	66
FCF	-931	-1024	-989	-758	-408	-163	177	625	1174	1788
$K_c(\%)$	12.9	12.9	12.9	12.9	12.9	12.42	11.94	11.46	10.98	10.50
$K_d(\%)$	8.0	8.0	8.0	8.0	8.0	7.8	7.8	7.7	7.5	7.0

As can be seen from the above table, many assumptions regarding the sales growth, cost of capitals etc. need to be made. In making these assumptions, all the difficulties analysed in the previous section need to be carefully considered.

For example, let us look at the assumptions on the revenue growth. The revenue growth rate of Amazon.com is 800% from 1996 to 1997 and 400% from 1997 to 1998. But such growth rate is not sustainable according to common sense (see e.g. Palepu et al. (2000)). It appears reasonable to allow the continuing momentum of high growth and assume that the growth rate will decrease to reach a stable rate of 6% in 10 years time. Obviously the assumption of growth rate does have an important impact to the quality of the final valuation result. But which growth rate to pick up is more like an art rather than a science. Thus the common sense is often called upon. A sensitivity analysis will be highly desirable if one need to have a clear picture of the firm's value.

In estimating the risk parameters, the traditional regression approach can not be taken as the historical data is very limited. Instead, the risk parameters here have to be estimated using the financial characteristics of the firm—the volatility in earnings, its size, cash flow characteristics and financial leverage. These risk parameters should not be left unchanged over the estimation period. As the firm matures and moves towards its sustainable margin and the stable growth, the risk parameters should also approach those of an average firm. In contrast to the regression approach, this approach is far more complicated and much harder to achieve. At the mean time, inevitably there will be more noise in the estimated risk parameters. This shows why the valuations for dot.coms are typically more difficult and subject to more noise.

It should be noticed that eventually, the forecast quality is really dependent on these assumptions. To ensure that the final valuation figure makes sense, each of these assumptions should be based on logical arguments and reasoning, especially they must be consistent with common sense in business. In understanding the final valuation figure, one also should have the assumptions in mind.

## **CONCLUSIONS**

As the emergence of the Internet and related technologies led to tremendous value creation for select entrepreneurs, it also raised questions about the sanity of a stock market that appeared to value companies more, the greater the losses they generated. It is argued that the traditional DCF approach, with some adaptations, is an essential tool for understanding the value of these companies. The recent Internet market correction has taught us that valuation results for dot.coms should be treated with care and should be well understood by looking into the valuation procedure and assumptions. The sentiment of markets has had a severe impact on the market values of dot.coms. Due to the complexity, lack of comparisons, and great number of future uncertainties involved, there are inevitably more noises in the valuations of dot.coms than firms in the 'old economy'. As the Internet industry matures, the DCF approach will be easier and easier to apply and the noises in the estimates will be further reduced.

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# A decision support framework for manufacturing subcontractor selection

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## ABSTRACT

*Virtual enterprise is viewed as an effective solution to fulfill the requirements of today's global market. One common key issue in designing virtual enterprise is subcontractor selection. In this paper, the factors affecting the subcontractor selection process are divided into two categories: hard factors and soft factors. Accordingly, a two-phase framework is designed to assist the decision making process in selecting efficient and compatible subcontractors. Phase 1 mainly considers that whether subcontractor candidates can offer certain products or services in time with high quality and low price; phase 2 concentrates on the cooperation potentiality of subcontractor candidates.*

*Keywords: decision support, subcontractor selection, virtual enterprise*

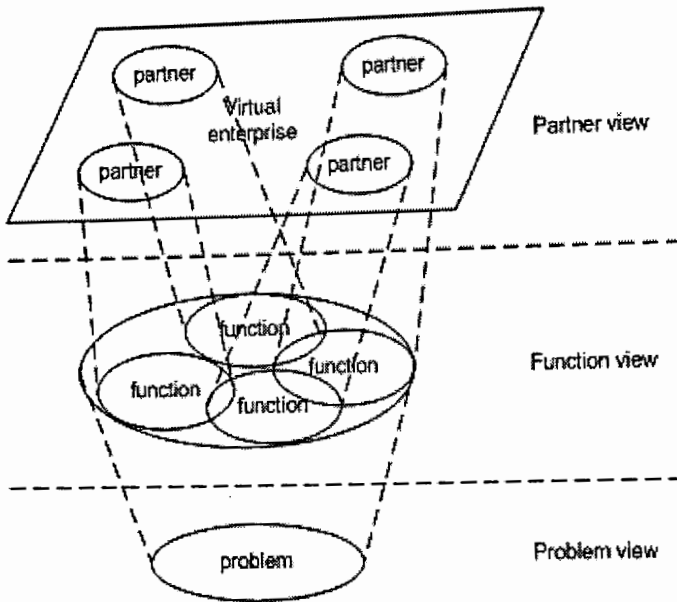
## INTRODUCTION

### Background

Global market of today demands rapid introduction of products while maintaining high quality and minimal costs. However, single enterprise has limited resource and capability while products become more complex and technology updates rapidly. It is a monumental task for large or small companies to accomplish all the aforementioned goals in a timely and efficient manner. Large companies are often very complex and slow to change, while small ones suffer from a scarcity of resources.

In such scenarios, virtual enterprises (VE), dynamic enterprise alliances (DEA), and value chain networks (VCN) are envisioned by many experts as efficient solutions for rapid introduction of a variety of products while maintaining high quality and low costs (Iacocca Institute 1991, Talluri et al. 1999, Chen et al. 2000, Lau et al. 2001). Because they are interchangeable on some extent, these terms are considered as the same thing in this paper.

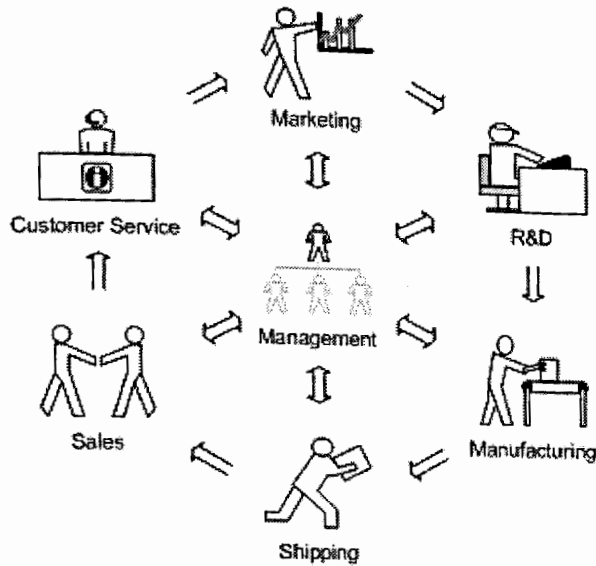
A virtual enterprise is a dynamic organization of collaborating enterprise partners brought together by information technology, in particular, the Internet. It re-organizes manpower, technologies, and other resources distributed in different enterprises to fulfill specific market requirements. A Virtual Enterprises is formed in the event of a market opportunity and is dissolved when the opportunity passes. Different views demonstrate the solution of virtual enterprise in Figure 1.



**Figure1: The solution of virtual enterprise**

Generally, virtual enterprises can be divided into three types by level of outsourcing: internal, stable, and dynamic (Snow et al. 1992). In internal virtual enterprise, firms own most of their assets and have limited exposure to outsourcing. A stable virtual enterprise engages in a moderate level of outsourcing. And usually, in this kind of virtual enterprise, a set of suppliers supports a 'lead' company. Dynamic virtual enterprises are formed by a group of independent companies. The lead company, acting somewhat as a broker, identifies potential partners who own a large or sometimes the entire portion of the assets in the virtual enterprise.

In a virtual enterprise environment, an industrial project is usually divided into subprojects and outsourced to subcontractors (e.g. suppliers and service providers). The subcontractors may further outsource their tasks to their subcontractors. These subcontractors are members of an alliance. They keep independent business processes and contribute 'core competencies' in areas, such as design, manufacturing, and distribution, etc. to the virtual enterprise. Figure 2 shows the relationship among members of virtual enterprise.



**Figure 2:**  
enterprise

**Membership of virtual**

It is clear that virtual enterprise will not exist without somebody to initiate it. So in such a virtual enterprise, one or several members must play the role of initiator(s) and manager(s) in leading the collaboration.

One common key issue in designing this new form of organizations is the subcontractor selection process. Subcontractor selection investigates the principles and mechanism in selecting subcontractors in an open marketplace. Although some work has been done in this area, practical mathematical models and optimization methods for subcontractor selection are still a challenge. Much of previous research emphasizes conceptual and empirical decision support models. They may suffer from one or more shortcomings such as being mathematically too complex, too subjective, etc. (Holt et al. 1998). What practitioners need is a methodology that is simple to use and understand, and yet produces reasonably accurate results (Huang G.Q. et al. 2000).

### **Difficulties, complexity, and solution**

When a selector, such as a broker, tries to find a set of subcontractors to meet particular requirements, it will encounter difficulties as below.

It is difficult to evaluate all the factors that will affect subcontractor selection as a whole. There are many factors to consider in making the selection, some of them are qualitative, such as friendship, credit, and reliability; as while as others are quantitative, such as cost and completion time. And there will be different sets of factors for different kinds of subcontractors. For example, a manufacturer candidate should have suitable machines, as while as a seller candidate should have suitable marketing channels.

It is an extremely tedious and time-consuming process to evaluate each combination of subcontractors and identify the most desirable one from them (Talluri et al. 1999). For example, consider a situation in which a virtual enterprise with four types of business processes A, B, C, and D is to be formed. If there are 5 potential candidates for role A, 6 for role B, 7 for role C, and 8 for role D. Then the total number of combinations under consideration is 1680 if these different roles of subcontractors are correlative.

A broker or initiator usually receives overload information about selection of subcontractors (Ho et al. 2000). Before make the decision to form a virtual enterprise, exhaustive efforts must be made to remove. To address the problems above, this paper proposes and introduces a decision support framework, which can assist selectors to find an efficient and compatible set of subcontractors.

In this framework, the factors affecting the subcontractor selection are divided into two categories - hard factors and soft factors. Accordingly, a two-phase decision model is proposed. Phase 1 mainly considers that whether candidates can offer certain products or services in time with high quality and low price; whereas, phase 2 concentrates on the cooperation potentiality of candidates.

The main body of this paper is divided into four parts. The first part explains the framework and architecture as a whole. The second part introduces how to define specifications for evaluation and selection. The next part discusses hard factors evaluation, followed by soft factors evaluation.

### FRAMEWORK OVERVIEW

For common evaluation and selection problem, when jobs or tasks are coming, the selector should take general procedure as below:

- (a) Defines specifications (task requirements), which include factors and their targets;
- (b) Collects related data and information from subcontractor candidates;
- (c) Evaluates and select the suitable set of subcontractors.

However, as mentioned above, there are many factors to consider in making the subcontractor selection. Some of them are qualitative, and others are quantitative. Consequently, these factors are divided into two categories. One is called hard factor, which includes those concrete, certain, and local factors (such as machine, price, and delivery time for certain products). Another is named soft factor, which includes those abstract, generalized, and global factors (e.g. product, people, technology, management and marketing related factors).

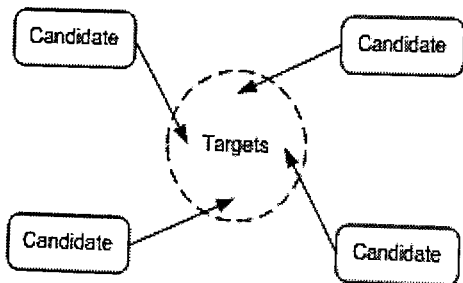


Figure 3-a: Hard factor and its target

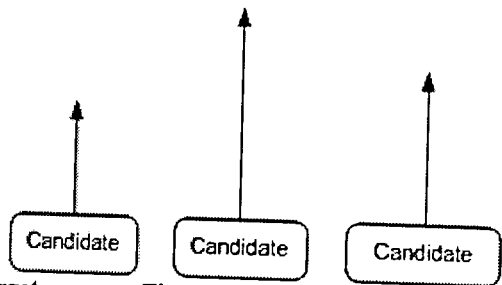


Figure 3-b: Soft factor without clear target

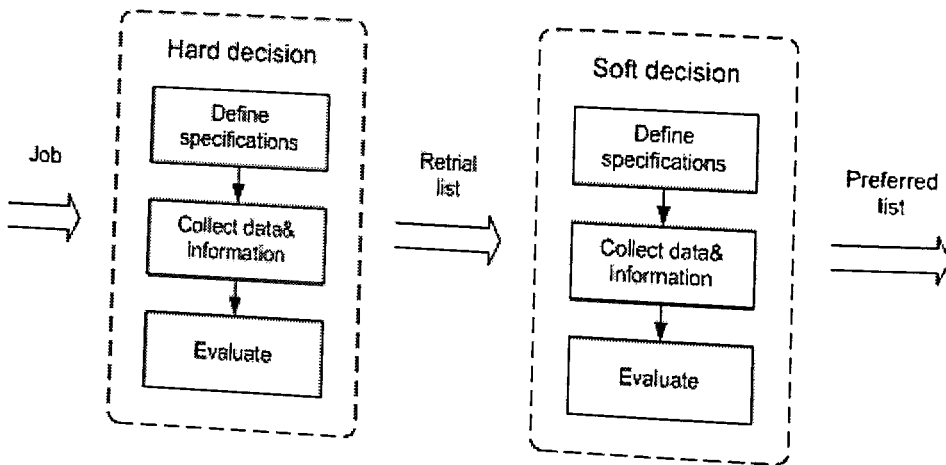


Figure 4: Task flow of the framework

Hard factors have exact targets, like Figure 3-a. A candidate will have advantage when it can satisfy those targets or be closer to them. Oppositely, soft factors have some fuzziness, because it's difficult to set an exact target for each soft factor. It is like Figure 3-b.

Accordingly, a two-phase framework is proposed. Phase 1, named hard decision, mainly considers that whether candidates can offer certain products or services in time with high quality and low price; whereas, phase 2, named soft decision, concentrates on the cooperation potentiality of candidates.

The basic function and task flow of this framework are defined as Figure 4. In which, the input of the system - 'Job', means a part or a component to be outsourced to the manufacturing subcontractor. In hard decision, a short list is identified from all the candidates. And in soft decision, a final recommended list is generated. By this method, the specifications become clearer, and the whole selection process becomes simpler.

In the whole selection process, there is a great deal of information interchange between the selector and candidates. And the information flow and process between the selector and each candidate is defined in Figure 5. There are five steps in the procedure.

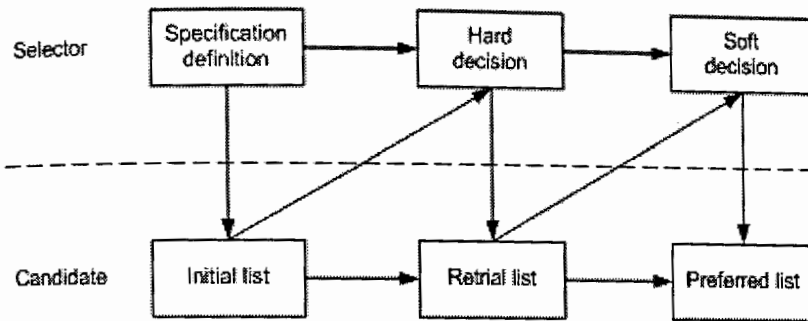


Figure 5: Information flow between selector and candidate

The selector prepares and defines hard and soft specifications (each includes factors and their targets), then publish the information about the task and hard factors to potential sub-contractors.

If a company that received the above information is interest in the job, it can submit related data according to hard specification to enter the initial candidate list. The data submitted here is called hard data.

The selector collects the data and evaluates it to identify the retrial candidate list, to which the soft factors will be sent.

- (d) The candidate on the retrial list submits soft data, relative data according to soft specification.
- (e) The selector collects the data and evaluates it to generate the final preferred candidate list.

A prototype framework system for manufacturing sub-contractor selection has been developed on the initial round of investigation, the architecture of which is showed as Figure 6. The framework is composed of five tiers, which are:

Interface tier, with which users (domain experts and decision maker) can communicate with the system.

Function tier includes three main functions of the system: Specification definition, hard decision, and soft decision. The next several parts of this paper describe them in detail.

Tool tier includes four groups of tools. The decision support group is the most important one. The reasoner is an inference engine, by which the system can draw conclusion from facts and knowledge. For example, given part information, the process method can be retrieved from method base. As while as, given process method, machine tool can be found from tool base. The matcher is called by hard decision to evaluate whether a candidate has the capabilities to complete the task. The fuzzy mapper is called by soft decision to evaluate the performance of a candidate on soft factors.

Data tier includes database (such as task base to store information about details of task, factor base to store information about factors and their targets) and knowledge base (such as method base that stores knowledge about process method for certain task, tool base that stores knowledge about machine tool for certain process method).

Base tier includes an integrated 3-level model (Huang X.G. 2000) for information (includes data and knowledge). The first level is a relational model to store information; the second is an Information Set Model



(ISM) model to describe information; the third includes several application models to fulfill different requirements of certain information objects.

Because of the length of the paper, only principles and theories of core functions: Specification definition, hard decision, and soft decision will be introduced here.

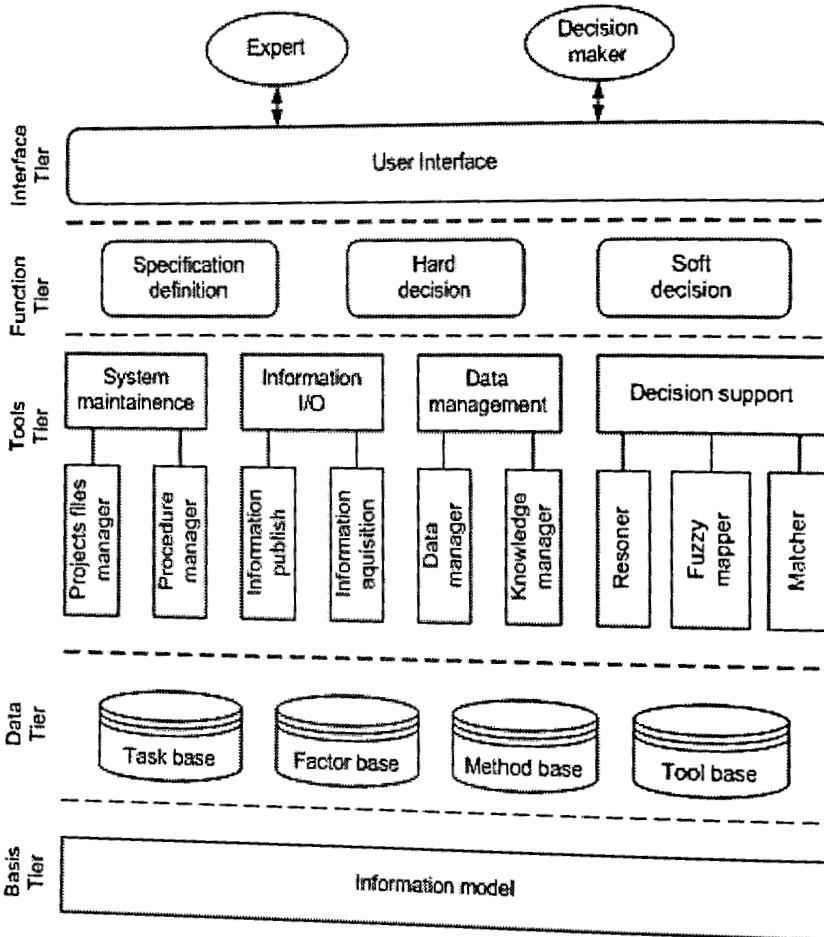


Figure 6: Architecture of the system

## SPECIFICATION DEFINITION

### Hard specification definition

This step is to define all the factors, and set their targets and maybe weights in some situation.

As introduced above, hard decision is to determine that whether a candidate has the capacity to offer certain products or services in time with high quality and low price. Thus, the hard specification should include factors about time, price, and quality. And quality of a certain part or component can be divided into detail technique specifications, which are generally offered by the designer of the product.

### Factors may take different types of values.

Low-pass. Some factors are of the type 'the smaller is the better'. For example, it's better if the price is lower, and deliver date is earlier.

High-pass. Some factors are of the type 'the larger is the better'. For example, it's better if the product has longer life expectancy.

Middle-pass. Some factors are of the type 'the middle is the better'. For example, it's better if the real size of a dimension is just between the upper and limitations of tolerance.

Some factors are of the Boolean type. For example, if the subcontractor has certain equipment or technology to complete the job.

And some time, it needs to consider about the importance of different factors. This system offers five grades for the importance of factors, and the grade increases from 1 to 5. Domain experts or selector can set the grade for each factor.

### Soft specification definition

Soft decision concentrates on the cooperation potentiality and long term relationship between selector and subcontractor, and soft factors are those abstract, generalized, and global factors. As a result, it is difficult to set exact targets for soft factors. This step needs to define soft factors and set their weights.

A hierarchical tree model is used to describe soft factors, and Figure 7 is such an example. There are five main soft factors in this example, which are product, facility, technology, personnel, and management. These factors can be continually decomposed into sub-factors, and all the factors make up of a factor tree. In this tree, the factors are called leaf nodes if they can be given quantificational evaluation directly and need not further decomposition; otherwise they are called branch nodes. This tree model can describe the soft factors subcontractors clearly, and be easily enlarged and modified. It should be noted that the factor tree might be different in different cases. It is up to the selector.

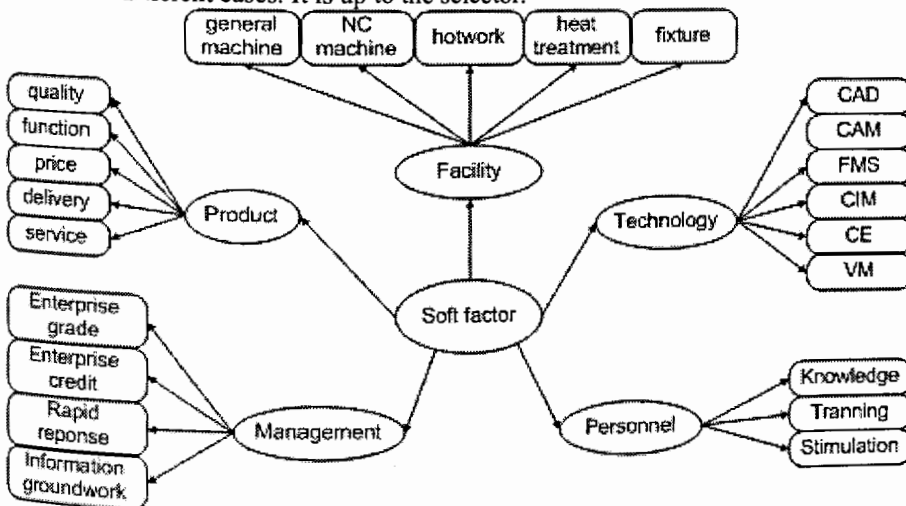


Figure 7: Example of soft factor tree

All the leaf-nodes need weights, which can be acquired according to the method of hard specification definition.

## HARD DECISION

### Single factor evaluation

In hard decision, hard factors are evaluated on the basis of targets (includes stands for the requirements of selector) and candidates' data (stands for the capabilities of candidates). Selector's requirements and candidates' capabilities may overlap. A candidate may have surplus or shortage of capability to meet the selector's requirements. And as mentioned above, the value of facts may be four types. This paper proposes four membership functions (He 1983) to describe the extent whether selector's requirements match candidates' capabilities. For reader's convenience, a list of notations is given here.

- $x$  the data of a candidate on one factor.
- $a$  the target of the factor.
- $b$  relaxation coefficient,  $b > 0$ .
- $\mu(x)$  membership function

High-pass (showed as Figure 8-a)

$$\mu(x) = \begin{cases} e^{-\left(\frac{x-a}{b}\right)^2} & (x < a) \\ 1 & (x \geq a) \end{cases} \quad (1)$$

On this kind of factors, a candidate will get better assessment score if his data is higher. However his score will reach ceil at the point of target, and will not increase after then.

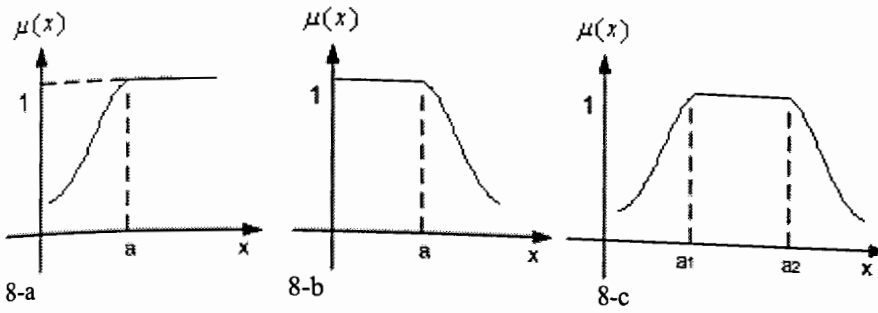


Figure: 8 Example of soft factor tree

Low-pass (showed as Fig. 8-b)

$$\mu(x) = \begin{cases} 1 & (x \leq a) \\ e^{-\frac{(x-a)^2}{b}} & (x > a) \end{cases} \quad (2)$$

On this kind of factors, a candidate will get better assessment score if his data is lower. However his score will reach floor at the point of target, and will not decrease after then.

Mid-pass (showed as Fig. 8-c)

$$\mu(x) = \begin{cases} e^{-\frac{(x-a_1)^2}{b}} & (x < a_1) \\ 1 & a_1 \leq x \leq a_2 \\ e^{-\frac{(x-a_2)^2}{b}} & x > a_2 \end{cases} \quad (3)$$

On this kind of factors, a candidate will get better assessment score if his data is closer to the middle of the target range. However his score will reach ceil if his data is within the range.

Boolean

In fact, this type is a particular case of type c (while  $b \gg x$ )

## Overall evaluation

There are two steps.

(a) Get weights for hard factors from importance grades by

$$w_i = \frac{g_i}{\sum_{i=1}^m g_i} \quad (4)$$

Where,

$m$  the number of hard factors  
 $g_i$  the importance grade of a factor  
 $w_i$  the weight of a factor

(b) Get overall hard factor evaluation score by

$$E_h = \sum_{i=1}^m w_i \mu_i(x_i) \quad (5)$$

Based on the result of hard factor evaluation, the selector can choose a proper number of candidates for retrieval list.

## SOFT DECISION

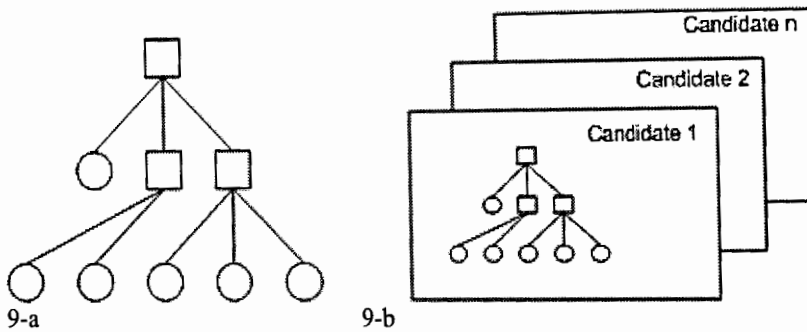


Figure 9: Tree data structure

A soft factor tree can be abstracted to a tree data structure (Xu 1996) as Fig. 9-a, and the data of every candidate make up a 2.5D forest as Figure 9-b.

### Leaf node evaluation

Because soft factors are qualitative, a measure of fitness is used to quantify them by

$$r_{ij} = \frac{S_{ij}}{\sum_{j=1}^n S_{ij}} \quad (6)$$

Where,

$i$  the index of factors  
 $j$  the index of candidates  
 $n$  the number of candidates  
 $S_{ij}$  the initial score of candidate  $j$  at node  $i$  given by domain experts or selector, from 1 to 5.  
 $r_{ij}$  the fitness rank of candidate  $j$  at node  $i$ .

### Branch node evaluation

For a branch node, if it's every child node has a fitness rank, the evaluation score of this branch node can be gotten by fuzzy mapping.

$$(e_1, e_2, \dots, e_n) = (w_1, w_2, \dots, w_m) \circ \begin{bmatrix} r_{11} & r_{12} & \dots & r_{1n} \\ r_{21} & r_{22} & \dots & r_{2n} \\ \dots & \dots & \dots & \dots \\ r_{m1} & r_{m2} & \dots & r_{mn} \end{bmatrix} \quad (7)$$

Where,

- $m$  the number of factors
- $w_i$  the weight of a factor

### OVERALL EVALUATION

The step-by-step procedure is described in brief as follows:

- (a) Set root node as current node.
- (b) Check whether all of its child nodes have fitness ranks.
- (c) If one of its child nodes has not rank, take the child node as current node, call step (a) recursively.
- (e) Get weights of its child nodes.
- (f) Get evaluation score of current node by fuzzy mapping
- (g) Return the evaluation score as fitness rank.

### CONCLUSIONS

The work on the subcontractor selection problem of virtual enterprise leads to the following conclusions:

A two-phase framework is outlined from which a selector can get decision support when it seeks efficient and compatible subcontractors. Dividing selection-related factors into two categories provides a way to simplify and shorten the whole decision process.

To describe all the factors clearly, a four-type model is defined to describe hard factors, and a tree model is designed to describe soft factors.

Membership functions are developed to quantify hard factors, as while as a fuzzy mapping-based algorithm is developed to quantify soft factors.

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# Investigating Educational Web Services: A Quantitative Review of 100 International University Sites

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## ABSTRACT

*The purpose of this research is to evaluate publicly available university Web sites and to classify those sites according to automatically generated profiles. Recent studies offer important insights about the state of the art of university Web sites and the future needs of Internet-based information services in higher education. Most of them, however, do not systematically explore the differences regarding structure and content of the observed systems. Our paper presents the findings of a study that comprises a sample of 100 international university Web sites. It investigates empirical differences and identifies explanatory factors for these differences. The study relies on empirical Web data as of May 2001.*

*Keywords: Higher Education, University Web Sites, Evaluation, Fortune Global 500, Comparative Analysis*

## INTRODUCTION

Dominating much of the Internet's history, universities have been actively pushing and developing related technologies until the beginning of the 1990s. In the mid 1990s, however, companies discovered public networks as a commercial opportunity. Together with the rapid development of desktop computers, communication infrastructure and graphical Web interfaces, the unprecedented growth of the World Wide Web began. Commercial organizations started to be the drivers of Internet technologies that were no longer exclusively used by academics. These mass-market technologies have been actively shaped by their commercial applications. How are they implemented and used by the academic sector? Currently, universities are putting a lot of effort into developing Web-based instructional approaches and knowledge brokerage platforms (dSPACE 2001; Brantner et al., 2001; Vrabic and Simon, 2001) or into deploying Internet-based administration services. This paper represents a first step towards an analysis of how and why university sites differ from each other and how they differ from commercially oriented sites.



## METHODOLOGY

There are several approaches to classifying Web information systems. Generally, they can be divided into manual and automatic methods. In this paper we will use an automatic approach to classify and evaluate publicly available sites.

Automatic Web evaluation methods are more efficient and immune to intra- and interpersonal variances than manual evaluation and provide the opportunity to analyse a large number of sites in a relatively short period of time. Naturally, these advantages come at the expense of sacrificing non-quantifiable, frequently recipient-dependent information (Bauer and Scharl, 2000). The methodology and classifications presented in this paper are based on the five factors: Interactivity, Navigation, Security, Layout, and Textual Content. Considering technical feasibility, these factors, which are characterized by varying degrees of measurability, evolved from reviewing previous approaches and exploratory case studies. They will be discussed in the following sections. A detailed description of the variables can be found in (Scharl, 2000).

### Sampling Process

For the analyses presented in this paper, a combination of purposive and stratified sampling was chosen. Purposive samples are based on expert judgments and pre-specified criteria. Stratification identifies sub-populations, or strata, and then selects objects for sampling within these sub-populations. The combined sample underlying this paper comprises 100 Web-based information systems of universities, divided into subpopulations by geographic region: North America, Europe, Asia, Australia & New Zealand, Mid- & South America, and Africa.

### Data Gathering and Extraction

A Linux-based architecture was used to mirror the data. This study concentrates on the primary user interface and does not consider password-protected areas. Thus the downloading limit of the mirroring process was set to 10 MB per site. Upon successful completion of the mirroring process, the retrieved files including event-log and error-log were archived for further processing. A mirroring limit of ten megabytes of textual data (excluding graphics and other multimedia files) was set for a better comparison of sites of heterogeneous size. To extract the information from the mirrored data, a Perl script was used to parse the HTML files of the mirrored Web sites and compute the variables for the classification. During the parsing process the HTML code was searched for markup tags to establish the values for the predefined parameters. The variables total number of images and distinct number of images, for example, are derived from the occurrences and attributes of the <IMG>-tag. Each occurrence of the tag increments the total number of images, while the distinct number of images is only increased when an image occurs for the first time as indicated by the graphical resource's URL in the SRC attribute of the <IMG> markup tag.

Similarly, the variables referring to external and internal links are calculated by counting the <A> markup tags. A more detailed analysis of the URL in the HREF attribute distinguishes between relative, absolute, and external links. Additionally, the script produced a single text file from the mirrored documents, which was stripped from the structural HTML markup and stored in plain ASCII format, which served as input for an exploratory textual analysis. Variables for each Web site were assembled into a single vector, producing a two-dimensional matrix for the sample of 100 university Web sites.

## ANALYSIS OF DATA

The extracted raw information needed to undergo further analysis to associate semantic meaning. In order to analyse the data of the university sample we first identified outliers and tried to assess whether they were real outliers or errors. Since many statistical methods are based on the assumption of normal distribution, we also analysed the pattern of distribution of our variables. Unfortunately, many of our variables proved to be far from being normally distributed or symmetric, even after transformation. Facing the problem of normality, comparing means of our variables classified by regions proved to be very difficult. The distribution between regions differs widely from normal and the spread of the distribution within the groups vary greatly (violation of the assumption of equal variances). We used boxplots to identify skewed distributions and identify different spreads across groups.

### Interactive Features of University Data

We measure interactivity with four groups of variables: Email, Script, Applet and Form. The first variable establishes the number of direct links to distinct email addresses referenced through `<A HREF="mailto:...">`. Script represents the number of occurrences of the `<SCRIPT>` tag per document. Applet counts the number of distinct java applets as determined through the reference to its class file. Form indicates the number of forms with distinct action attributes.

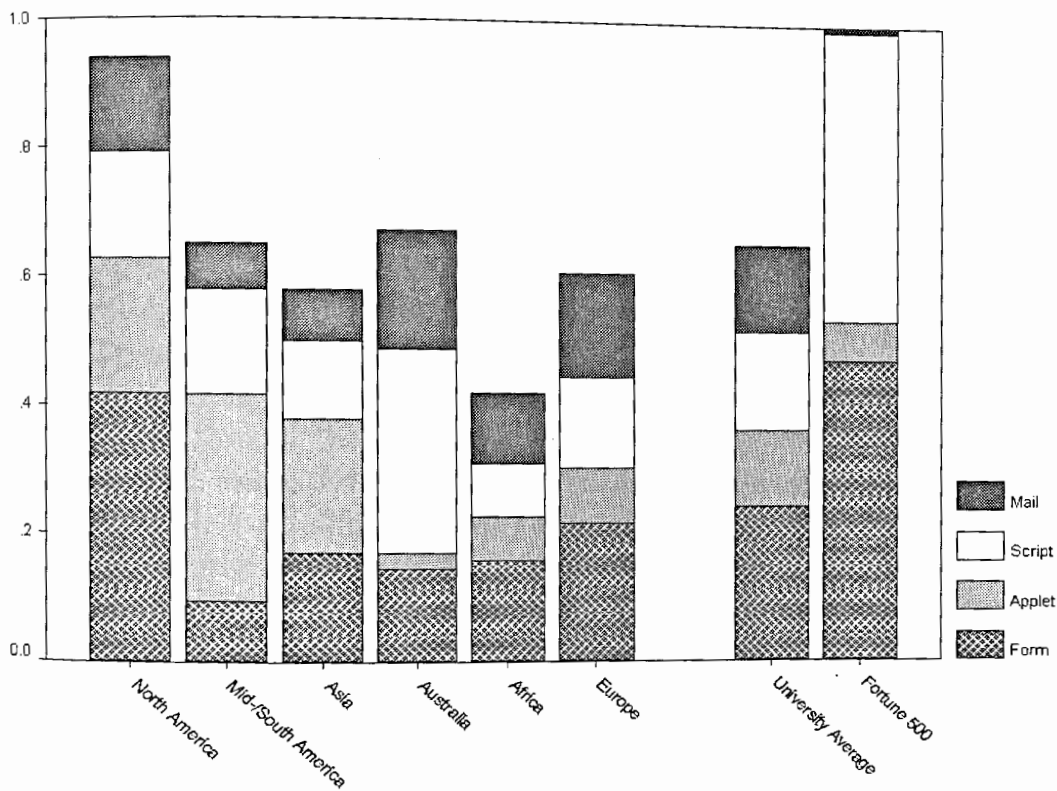


Figure 1: Comparing the level of interactivity (standardized mean values)

Analysing regional differences shown in Figure 1 we were surprised that the average interactivity values of the European sample were much lower than the values for North America. Having visited the Web sites we had already assumed that, on first sight, the European sample was less homogeneous than the samples of the other regions. Using box-plot analysis and percentiles we identified that the spread of the European sample was bigger for most variables than for all other regions. Having a de-tailed look on the outliers at the lower end it made sense to divide the heterogeneous European sample into two subgroups: Western European countries and Eastern European countries. The chart in Figure 2 demonstrates how the split of the European sample affects the average values for Western Europe.

Comparing the average university sample to the Fortune Global 500 values shows higher average values of the Form variable for the Fortune 500 companies than for the university sample. In terms of interactivity, this result shows us that commercial Web sites have a higher focus on interacting with their stakeholders via forms – e.g., customers requesting brochures, ordering online, registration forms of all kind, feedback forms, etc. The university sample shows higher average values for Applet tags whereas the number of Script tags is lower compared to the Fortune 500 sample. We conclude that many commercial Web sites use the scripts for layout purposes and to ensure a consistent corporate identity. The Mail variable is clearly higher in the university sample than in the Fortune 500 sample, due to the fact that university Web sites refer to the email addresses of all staff and students. Commercial Web sites and large corporations in particular tend not to put all email addresses of employees on their sites.

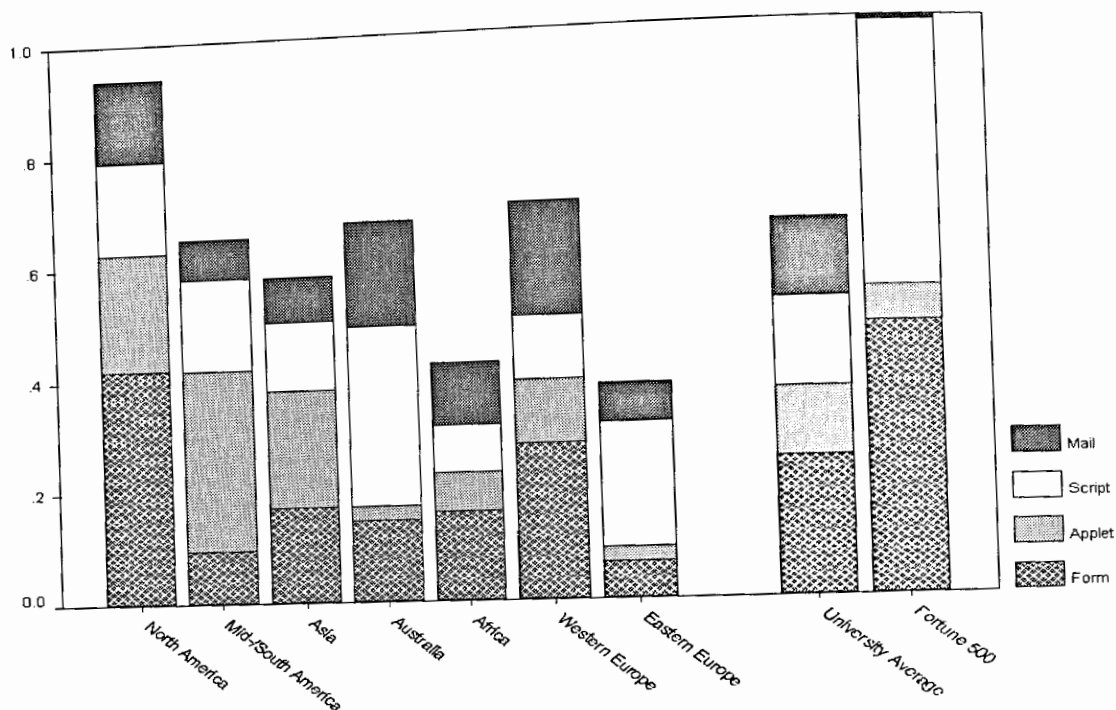


Figure 2: Splitting the European part of the sample into Eastern and Western Europe

## DISCUSSION AND OUTLOOK

This report on our work in progress concentrated on one factor, the level of interactivity. There are certain limitations in analysing Websites automatically since it is not possible to analyse pages in password-protected areas. Nevertheless the primary user interface does provide sufficient information to make statements on the general level of interactivity. Further research will also investigate and compare other criteria outlined above (navigation, security, layout, textual content).

In addition to comparing individual statistical criteria, we used cluster analysis to identify homogeneous sub-groups based on selected characteristics. Clustering our current sample proved to be very difficult. We will therefore expand our sample and concentrate on few countries, trying to identify other factors than regional differences. Analysing the linear relationship between our variables and additional university data (university budget per student, number of students, number of staff, IT budget, type of funding, type of university, etc.) will help us explore additional explanatory factors for the differences in structure and content of university Web sites. We will then construct a roadmap for further investigations and to derive recommendations for both Web developers and university management.

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# Constituent Market Orientation and Virtual Organisations

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## ABSTRACT

*This paper applies the understandings about Constituent Market Orientation gained by research undertaken by Tellefsen to the six organisational types of the taxonomic model of Virtual Organisation developed in the School of Management Information Systems at Edith Cowan University to identify the most effective distribution of resources and management attention in combinations of real and virtual e-business scenarios.*

*Keywords: Virtual, e-Business, Management, Learning, Theory, Markets, Orientation*

## INTRODUCTION

When constructing a business solution, many constituencies and stakeholders determine the idea's market value, effectiveness, and efficiency. These include labour markets, downstream markets, collaborative markets, upstream markets including suppliers, market regulators such as industry associations, governments, and general influencers like the media and the public. Market oriented leaders direct their attention and efforts towards these constituent markets to maximise a business unit's competitiveness. In total, the above distribution of attention forms the 'constituent market orientation' of an organisation.

Tellefsen (1995, 1999) has undertaken extensive research justifying a top management led programmatic and natural learning based on feedback from the constituents ('market-back') theory of Constituent Market Orientation. The research findings are based on information provided by 235 CEOs, 244 market managers, 188 purchasing managers, 163 personnel managers, 179 union representatives, 154 PR managers, and 175 lobbying managers. Tellefsen's original hypotheses were aimed at conventional larger organisations. His findings, however, indicated that this Constituent Market Orientation theory is applicable more broadly.

This paper applies Tellefsen's Constituent Market Orientation theories and findings to the forms of virtual organisations commonplace in the e-commerce arena categorised in terms of the taxonomic model developed at the School of Management Information Systems, Edith Cowan University (see, for example, Burn and Barnett, 1999, Burn et al., 1999, Burn and Tetteh, 2000, Lethbridge, 2001, Marshall et al., 2001).

## OVERVIEW OF TELLEFSEN'S CONSTITUENT MARKET ORIENTATION FINDINGS

Market orientation is essentially a theory of market-driven organizational learning and innovation. An individual learns through interacting with its environment. The closer the interaction with a particular part of the environment, the more the individual learns about that part. If an individual has no direct interaction with a part of his or her environment, that part will become unknown and invisible. Commonly, the constituent market orientation of an individual becomes unbalanced and results in increased focus on some constituents and partial ignorance of other constituents.

The configuration of an individual's group membership is the most important factor in their orientation. We are social beings. Intense learning occurs primarily in face-to-face groups. Groups with frequent contacts and internal double and triple-loop learning establish a strong culture with common beliefs, values, goals, priorities, language, habits and recognition patterns. In larger group contexts, they form a sub-culture. The number, type and heterogeneity of an individual's cultural traits (often referred to as the individual's personality) depends on the number and type of social groups he or she belongs to. Each individual's consciousness is limited, tending to routinize behavior, and result in focusing on a limited set of social relations. When an individual is preoccupied with something — due to habits or previous learning of beliefs, values, priorities and goals — other things are unattended, invisible or not comprehended.

Crossan et al (1999) say the same limitations apply to groups sharing mental frames, paradigms, observations and experiences. These limitations, combined with group wise double-loop learning; result in many groups developing distinct sub-cultures that are often homogenous and stable. These factors interact with other organisational, management and leadership factors in significant ways. An organization institutionalizes what tasks are to be carried out by whom, who works with whom, and the rules and intensity of interactions. The nature and structure of the institutionalization has a profound impact on the emergence of distinct sub-cultures within industrial clusters, networks of cooperating firms, single firms, and inter- and intra-organizational work-groups. The tighter group-internal relations are, and the looser the group-external relations are, the stronger the sub-cultures of individual groups become.

Organizations that consist of heterogeneous groups with strong sub-cultures become extremely difficult to govern and lead. Common language, perceptions, values, experiences, goals and habits are weak. Performance and behavior become unpredictable for the organization as a whole, and the organization will not be able to develop a common identity and image. The challenge to the leadership, therefore, is to establish learning loops that are programmatic and led from the center of power. The purpose of these programmatic learning loops, is to establish common purpose, values, and objectives. They must also result in, a common understanding of language, facts, and the environment, with its internal processes and structure, constituents and stakeholders. From a strategic point of view, it is also essential to establish definition between 'us' and 'others': the limits and borders of the organization and its competition. To establish a strong common culture in the organization, the common elements established by the leadership must be communicated to all members of the organization, and be implemented in all decisions regarding leadership style, organizational architecture, structures and processes, strategies, operations, services and products, and be reflected in all external communication with the constituents. An alternative, to this organizational approach to producing and exchanging values in the sub-groups of an organisation, is the market solution of distance and freedom of choice among the actors. Resource-based and agent-based theories of networks have explored the feasibility and economics of these alternatives: administrative versus market solutions of exchange (Conner, 1991, Dahlstrom and Nygaard, 1999, Heide, 1994).

Knowledge management is a key factor in the above issues (see, for example, Prusak, 1997). Learning theory distinguishes between tacit and explicit knowledge. Explicit knowledge can be communicated through a common language, which includes the meaning and feelings attached to body language, pictures, sound, and any form of symbols including written language. Knowledge can also be tacit, and this can occur at several levels: individual, work group, network, firm, industry, language group,

etc. In the context of e-business, a prerequisite for an e-based business solution is that knowledge received via an electronic network is explicit between the senders and the receivers. This implies that tacit knowledge cannot become part of the e-commerce systems interface with users, although it has a role in developing and understanding the non-visible parts of an e-commerce solution.

## **FOUR KEY PROCESSES IN BUSINESS IDEA IMPLEMENTATION**

E-systems have advantages in generating and distributing data, but limitations in interpretation of the data necessary for generating learning that can lead to adaptive and generative innovation. E-networks, as system enablers for gathering and disseminating information, have limited usefulness in governance and leadership processes, and those exchange processes that involve physical products and services requiring problem-solving or the use of tacit knowledge. Tellefsen's findings indicate that the leadership of an e-business therefore has to construct and manage four parallel systems in addition to the system for current operations. To establish and maintain a holistic business idea the leadership group needs to use:

**The power system:** Ownership that establishes who 'we' are, social legitimacy, authority to make decisions, risk-taking, the distribution of values gained and consumed (including financing of investments, distribution of revenues and costs, liquidity and profits)

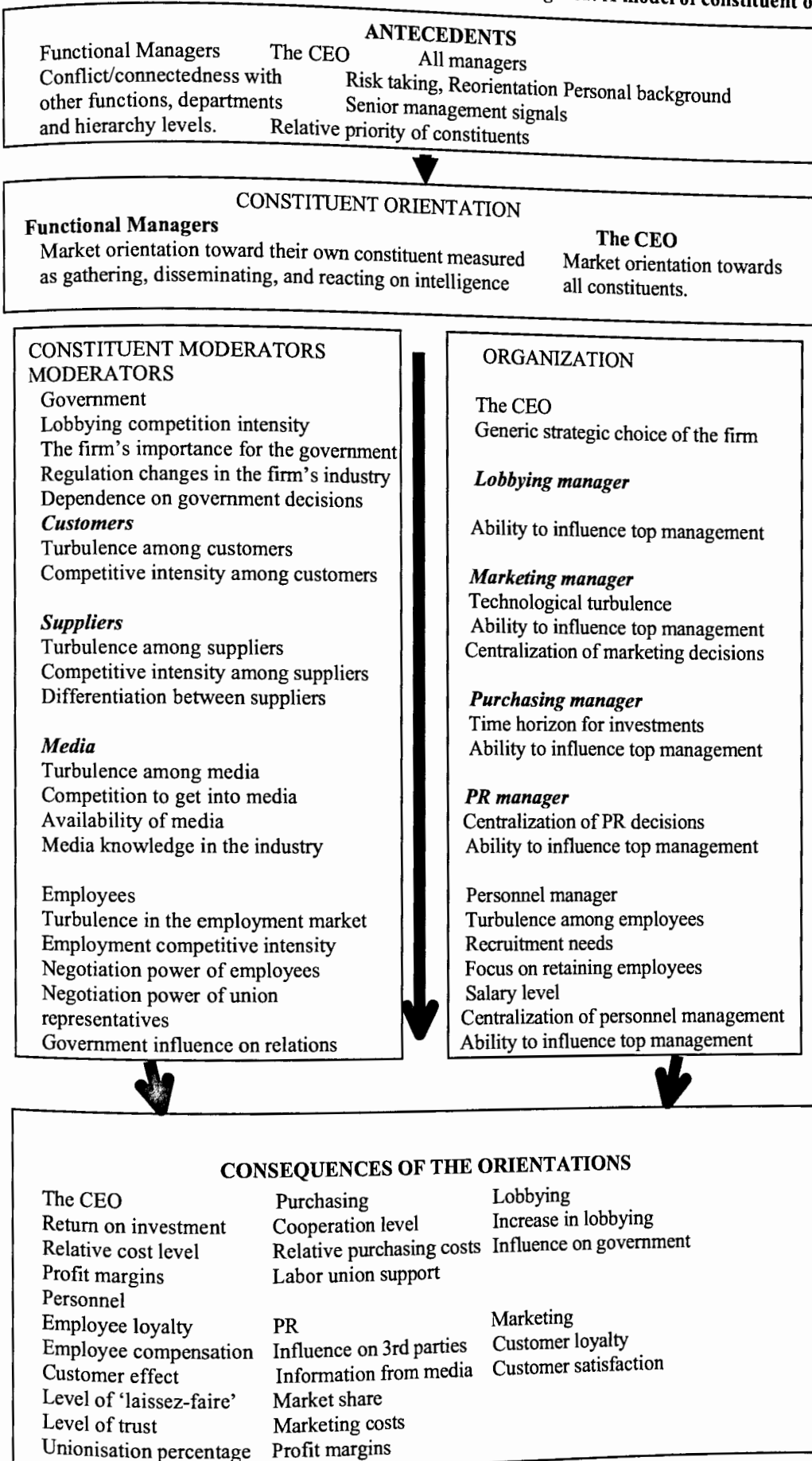
**Internal driving forces:** Common beliefs, purpose, values and objectives of the organization

**Strategy making processes:** The processes and systems for developing organization-wide agreement on who 'we' are, our image, who we want to relate to and exchange values with (the stakeholders), who the 'others' are (competition and other constituents), how to compete (defining moral and wanted behavior) and with what (technology and know-how).

**Operative management and systems:** Management processes and procedures, including methods for task delegation, solving disputes, accountability, value production, value distribution, delegated risk-taking, Development and integration of real-world and virtual systems of operations.

How organization-internal factors influence the extent of market-driven learning, and how the resulting constituent market orientation influences various organizational outcomes is illustrated in figure 1.

Figure1: A model of constituent orientation





All e-commerce and 'virtual' organisations contain, in some form, the roles listed in Figure 1: just like any real-world organization. In addition to internal management factors, the history, culture and competitive climate of the industrial cluster influence the degree of market-driven learning that takes place within all members of a cluster. Three factors influence the profitability, and therefore the strength of market-driven learning towards each separate constituency:

The intensity of competition  
The differentiability of the competing firms in the eyes of the constituents  
The rate of change in the market place (turbulence in both the supply and the demand constellations in the market) (Tellefsen, 1995).

## DIFFERENT FORMS OF VIRTUAL ORGANISATION

A 'virtual organisation' is a group of otherwise unconnected organisations that act together. Virtual organisations have adopted many forms. Research undertaken at the School of MIS, ECU has resulted in the identification of a six-element taxonomy of forms of virtual organisation (Burn and Barnett, 1999, Burn et al., 1999, Burn and Tetteh, 2000, Lethbridge, 2001, Marshall et al., 2001). These are:

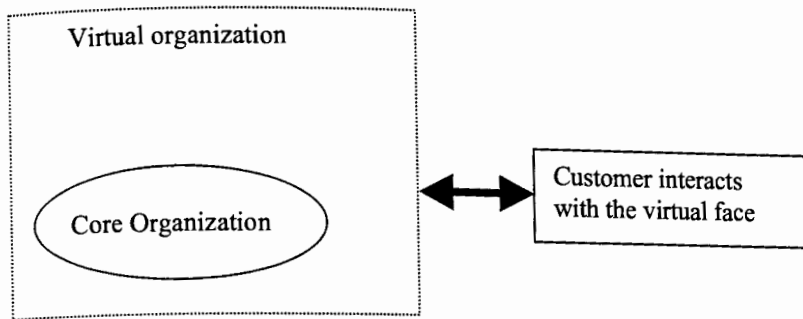
Virtual Face  
Star Alliance  
Market Alliance  
Co-Alliance  
Value Alliance  
Parallel Alliance

These classifications have been used by the above authors for a number of different purposes in formulating theory and strategy in the development of e-business networks. They offer a useful way of structurally relating the spectrum of 'virtual organisations' to the underlying real organisations. This is the basis of the way that these models have been reworked for use in the analyses described in this paper. The diagrams below include slight modifications to the details of the above models of virtual organisation to expose additional detail, and to correct minor structural flaws. For example, the virtual face model below emphasises that the customer relates to the virtual face rather than the underlying organisation. The value chain model below has also been amended to show that customers usually interact only with one end of the value chain.

### Virtual face

The virtual face virtual organisation is an alternative representation of a conventional organisation. In most cases of interest, this is an Internet-enabled organisation that works closely with the conventional organisation that underpins it, e.g. Internet banking organisations are commonly 'virtual faces' closely associated with traditional banks. In such an operative systems solution, the traditional core organization carries the whole burden of extending the above four processes of holistic business idea implementation to the virtual space. The two key questions are: 'to what extent programmed internal and market learning can turn tacit knowledge into electronic automation of services and build them into the e-system', and 'to what extent can expert tacit knowledge be reduced to explicit knowledge simple enough to enable network members to use the virtual systems solution. Those who will not or cannot learn what is needed to use the e-solution will be served by the traditional system. In order to maintain a unitary brand, the virtual and the traditional organizations have to share all cultural traits connected to the personality of the brand.

Figure 2: Virtual Face

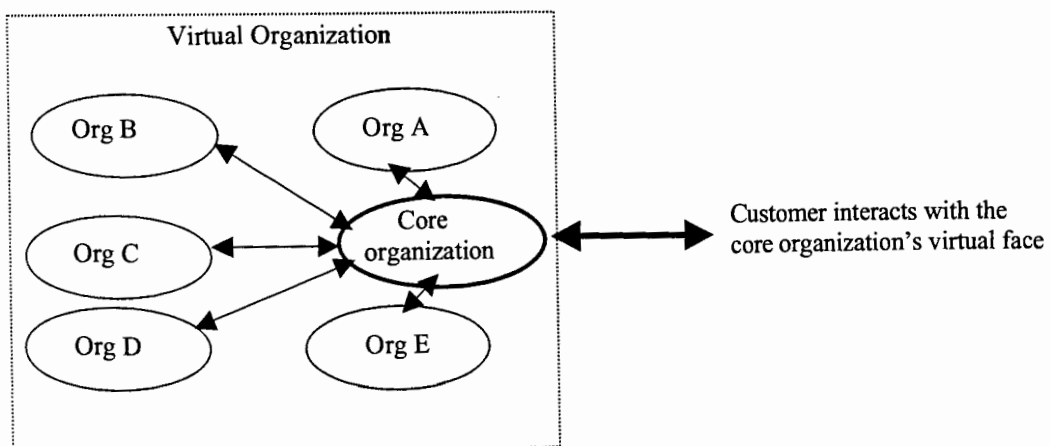


### Star Alliance

Star alliances occur when a group of otherwise independent organisations are clustered around a single key organisation (the star). This is common in many fields that have a tradition of main contractors and subcontractors.

In a Star Alliance, the core organization carries the whole burden of implementing the four processes of business idea implementation. The star builds the personality and image of the corporate brand, as well as the various branded products and services offered to the customers. The star will gain supplier power if its leadership is able to customer-orient its sub-contractors. That requires the star to have a broad constituent orientation that as a minimum contains strong up- and down-stream market-driven learning. It is not important to encourage the development of common cultures between the sub-contractors and the star. Such an effort may in fact be detrimental to the network's ability to produce generative learning needed for proactive behavior and breakthrough innovation as seen by the customers. The star must put a lot of effort into using the data generated by the e-solution for interpretation and feedback to the sub-contractors to ensure customer orientation of the sub-contractors.

Figure 3: Star Alliance

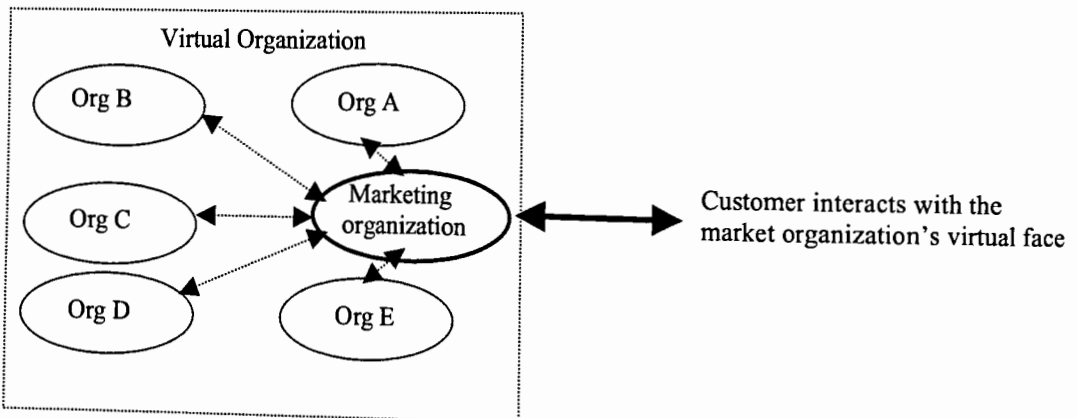


## Market Alliance

Market alliances occur when a single organisation manages the relationships with customers. Market alliances are significantly different from star alliances regardless of their apparent structural similarity. The main difference is the 'star' of a star alliance is responsible for managing the whole of the virtual organisation, whereas the focus organisation in a market alliance only undertakes sales and marketing activities. A farm produce marketing association is an example of a market alliance: different farmers coordinate their production under the guidance of the marketing association, which also acts as an intermediary to customers.

In this situation, the ownership structure has a profound impact on the network's ability to become downstream market oriented. If control rests with the producers, the tendency is to make strategic and operative decisions that make life easy for the alliance members, while customers receive inferior service, products, and variety to choose from. Strategies tend toward forced membership of upstream suppliers in order to achieve monopoly powers. The e-system tends to exploit economies of scale, rationalization, and competition on price rather than value-added, differentiation and segmentation. Product and service innovation tends to be stifled, while administrative and production process innovations tend to be overly supported. The e-system tends to become control-oriented. If several market alliances compete, the alliance that manages to remain most downstream market oriented will normally become the customers' choice, but not necessarily the most profitable or competitive. The outcome depends on the heterogeneity and bargaining power of the customers relative to the same factors among the alliance members.

Figure 4: Market Alliance

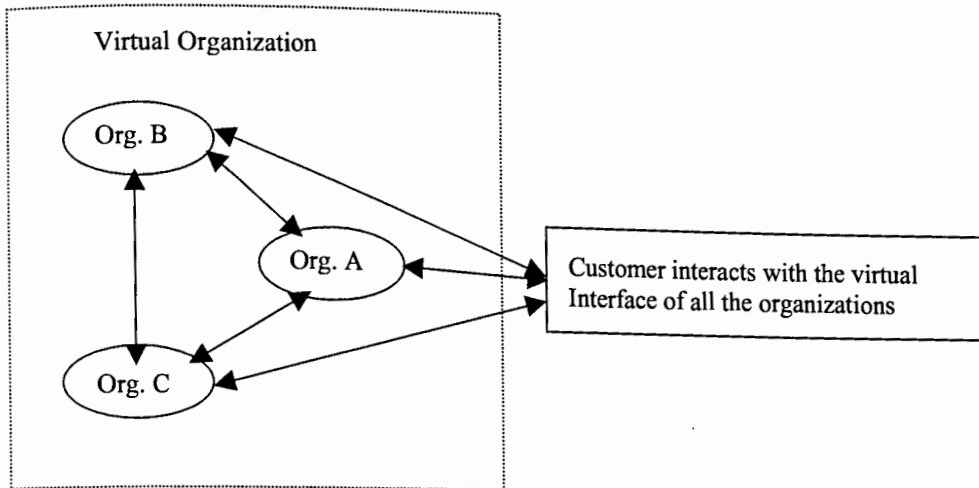


The dotted arrows signify that communication in the virtual operative network is only related to marketing and customer intelligence.

## Co-Alliance

Co-alliances occur where organisations participate equally in managing the virtual organisation and interacting with customers. Examples of co-alliances are when businesses manufacturing different goods within the same market collaborate to gain economies of scale, scope and coordination. In this case the leaders of the cooperating organizations either have to establish a governance and leadership organization over and above the co-alliance members, with some form of inter-organizational operational teams, or have one of the organizations take the lead on defining and developing the common elements and systems. Such alliances are inherently unstable, and tend towards full integration or revert to market solutions (Lorange and Roos, 1992).

**Figure 5: Co-alliance**

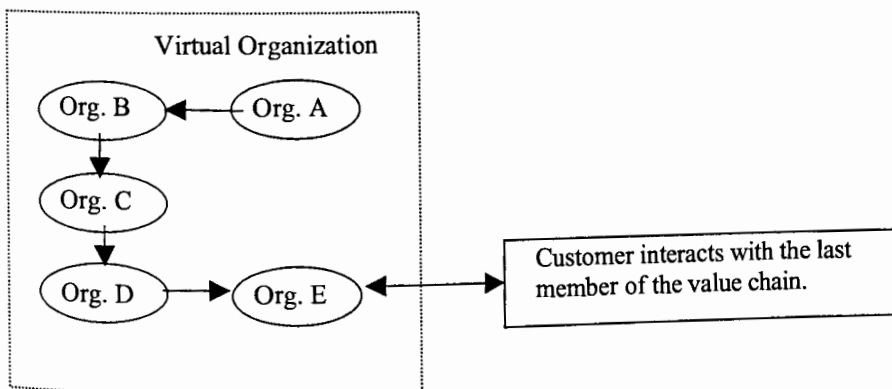


**Value Alliance**

Organisations form themselves into a value alliance where there are benefits in integrating their value/supply chain. Value alliances are characterised by each member of the alliance adding value sequentially. The customer submits their order to the value chain, their order results in a flow of product through the value alliance. They are supplied from the organisation at the end of the value alliance chain. The value alliance & supply chain is jointly managed and individual order management is sequential passed from one member of the value alliance to another as the product passes along the value chain.

A common form of value alliance is the organisation of businesses into a virtual market, e.g. for the manufacture of raw materials into goods. The end-of-the-chain organization carries the main burden of creating a corporate image and brands, and must be highly up- and downstream market oriented in order to play its leading role. The end-of-the-chain organization must ensure that the upstream organizations become sufficiently customer-oriented, and take interest in developing the suppliers to become sufficiently integrated and competitive in the activities they undertake. Learning processes and e-solutions have to be integrated along the value chain through cooperative research and development. The e-system must allow for quick data throughput for value chain coordination. This type of network is inherently unstable, and will tend towards full merger or pure market-solutions at each stage of the value chain. The deciding factor is often whether the alliance manages to produce superior learning for adaptive and generative innovation in each critical activity. If superiority is achieved, merger normally follows. If one member organisation fails, it is often replaced.

**Figure 6: Value Alliance**



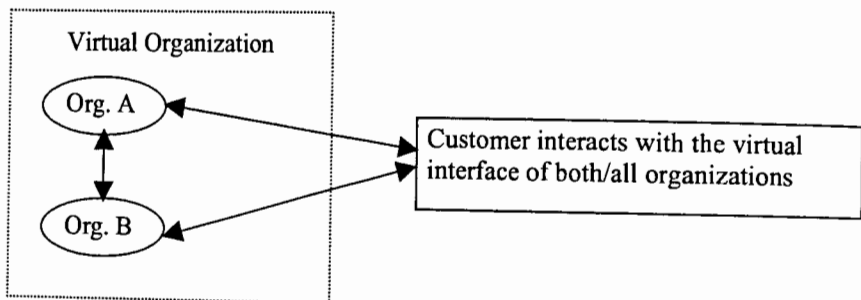
The arrows signify the main flow of goods and services. In terms of communication the arrows would be interactive, but only along the value chain.

### Parallel Alliance

Parallel alliances occur when two or more organisations must work together because their output is interdependent. This arrangement is common in computer software and hardware fields where, for example, an operating system is written specifically to utilise facilities provided by a particular central processing unit chip. In this case, the customer must be taught that the alliance partners are cooperating and ensuring that the solutions work together.

The network needs horizontal links between the cooperating organizations at all activity levels, including in the market place that is visible to the consumer. The two or more cooperating organizations do not, however, have to establish any leader or a common culture. Each party can also make arrangements with any number of competitors to their alliance partner. If, however, the cooperation between the alliance partners leads to learning and innovations that are consistently superior to other cooperative arrangements the two have, the alliance will tend towards full merger, and the exclusion, for both parties, of other horizontal alliances.

Figure 7: Parallel Alliance



## SUMMARY

This paper has brought together Tellefsen's theories and findings about Constituent Market Orientation and the taxonomy of virtual organisations developed at the School of MIS at Edith Cowan University. Combining these two theory streams enables the analysis of virtual organisations typical of e-commerce arrangements through the use of well-justified market orientation theories.

Undertaking these analyses points to the fact that:

E-commerce is most often an extension of business that also takes place in the real world  
The real and virtual solutions have to work together, i.e. promote a common image, provide synergies etc.

The extent of e-based solutions is dependent on the ability to convert tacit knowledge to automated e-systems and/or explicit knowledge at all user interfaces. Value creation that cannot be automated because of tacit knowledge has to be taken care of through real world exchange and production methods.

The virtual e-commerce has to be supported by other real-world processes of leadership, cultural harmonization, and learning for innovations in administration, technology, know-how, systems, products, services, etc.

The virtual solutions provide the real world actors with faster and new data that may both support organizational learning as well as operations. The virtual systems can only in a limited way interpret the data in the process of converting the data to knowledge, understanding, problem solving and innovation.

The need for one organization to take the on the leadership of the alliance depends on the nature of the alliance. The prime factor is the need to control and coordinate the interface with the customers, to provide a branding of the alliance in the minds of the consumers. This factor is independent of the degree of virtuality of the organization.

The alliances are inherently unstable, and will tend toward totally administered solutions through mergers, or towards pure market solutions. The relative efficiency of learning and innovation within the alliance versus freedom of choice and competitive learning and innovation efficiency will often decide the outcome. The future competitiveness of any e-commerce solution is dependent on these learning and innovation processes that can only be supported by the data stream from the virtual system.

The approach presented here has practical benefits in the ways that it enables the use of well-established and practically useful theories that support managing real world complex organisations in the development of theories about e-networking technologies and organisational structures:

It establishes an improved context for successfully creating e-spaces (virtual organisations) and using them in real situations.

It helps CEOs decide which virtual organisational structures are likely to be more successful in business terms. It offers a foundation for using the properties of e-networks

The paper draws attention to two interface issues important to virtual organisations:

The interface whose purpose is the creation and governance of the virtual organisation.

The placement of the e-system with respect to the other production and transactional systems in organisational clusters.

The above practical and theoretical features imply that this approach to choosing virtual organisational structure supersedes prior methodologies whose predominant focus is on facilitating information management processes or providing technologically elegant solutions.

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# Actual and perceived levels of risk in consumer e-commerce

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## ABSTRACT

*Most consumers perceive e-commerce as the riskiest shopping method in comparison with other methods of payment. Confidentiality of credit card numbers is an overriding issue restricting consumer participation in e-commerce. As a consequence, it is imperative to measure the levels of risk in e-commerce and other shopping methods. This study is an analysis of perceived and genuine risks associated with e-commerce. The levels of risks perceived by consumers in various shopping methods including Internet shopping are described, as are the levels of actual risk. The differences between the two are considered, and methods of dealing with the differences are given.*

*Keywords: Electronic Commerce (E-Commerce), security, encryption, cryptographic algorithms, actual risk, perceived risk, risk perception gap, Secure Sockets Layer (SSL), Secure Electronic Transaction (SET).*

## INTRODUCTION

E-commerce is an innovative business model that is driving organizations to transform their core business functions to remain profitable. In addition, it provides many useful functions, which facilitate a number of business activities, according to Ghosh (1998). Increasingly many companies are utilizing e-commerce technology as a medium of conducting business since it has advantages for both the supplier and the consumer. The emergence of e-commerce technology makes it easier for consumers to engage in online shopping because of the lower cost and ease of acquisition of products or services via the Internet

Although e-commerce provides many benefits to consumers, e.g. convenience, greater choice, lower prices, and more information, there are also a number of barriers restricting its growth. The fact that breaches of Internet security are reported with great frequency means that there is a danger that potential users will be reluctant to engage in e-commerce because of fears about security. This means that user trust is a key enabler for the growth of the e-commerce market. Nonetheless, the real level of risks in e-commerce world and the level of risks perceived by consumers are still uncertain. Ideally, the risks involved in an e-commerce transaction should be no greater than the risks in a conventional transaction. The main objectives of this paper are as follows:

- to assess the main risks for home users engaging in Internet e-commerce;
- to assess home users' perceived levels of risk for various types of commerce, including e-commerce;
- to understand whether a disparity between the real and perceived risks exists.

For the purposes of this paper we assume that e-commerce payments are made using credit or debit cards. Whilst other forms of payment exist, debit/credit will probably remain the dominant payment method for some time to come.

## POTENTIAL E-COMMERCE PARTICIPANTS

Recently, e-commerce has become a strategic tool for companies wishing to generate trade from the electronic consumer (e-consumer) on the Internet. The main requirement for a home user to engage in e-commerce is that the user has a connection to the Internet. We therefore suppose that all users with Internet access are potential e-commerce participants. Based on this assumption, Figure 1 shows that there are more than four hundred million potential e-commerce participants.

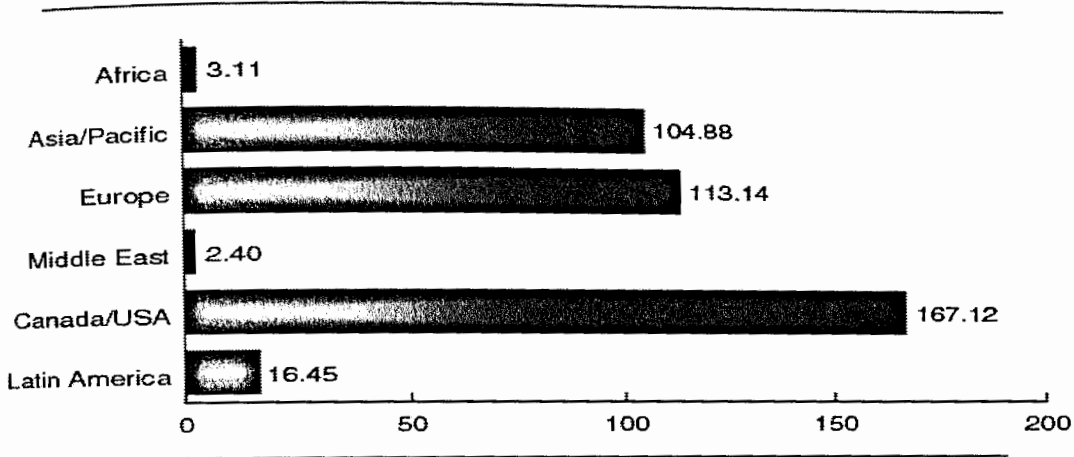


Figure 1: Global Internet Population (millions)  
Source: Surveys, November 2000 (<http://www.nua.ie>)

Although there are various methods of accessing the Internet, we assume here that the home user connects to the Internet using a Windows-based PC equipped with a modem, and that web accesses are performed using a popular browser such as Internet Explorer or Netscape Communicator. Whilst a variety of access devices can be used, 56k modems are currently the most popular means of access (see Figure 2).

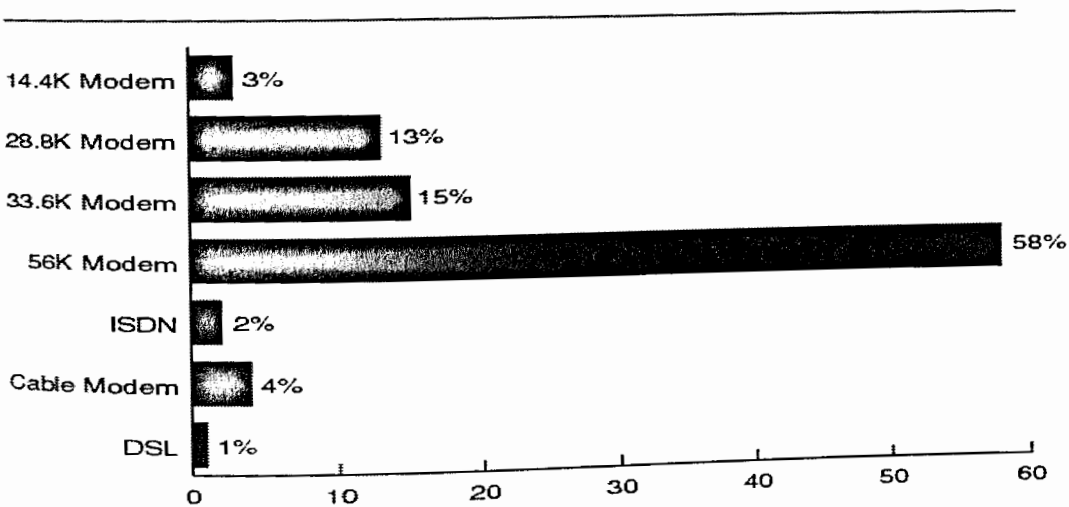
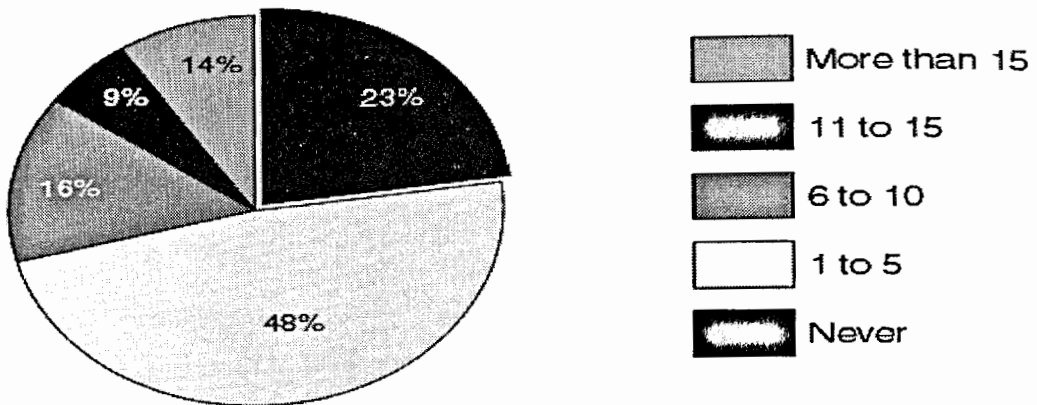


Figure 2: Devices used to connect to the Internet  
Source: About.Com, August 1999 (<http://internet.about.com>)

## PERCEIVED RISKS IN E-COMMERCE

Human perceptions of e-commerce risks vary widely, just like other human characteristics. Some people believe that e-commerce is worth participating in because it offers several useful functions, such as convenience. On the other hand, others perceive e-commerce as being too risky. A survey of 2,810 adults was conducted by Harris Interactive Survey (<http://www.harrisinteractive.com>) in August 2000 to examine consumer perspectives regarding e-commerce. For example, they asked how many times that potential e-commerce participants had ordered online in the last twelve months, and where relevant the reason why they had never purchased via e-commerce. In addition, the survey also covers the types of information that need to be protected in e-commerce from the consumer perspective. The results are summarised in Figure 3.

### 3.1 How many times have consumers purchased online in the last twelve months?



### 3.2 Why has consumer not purchased online in the last twelve months?

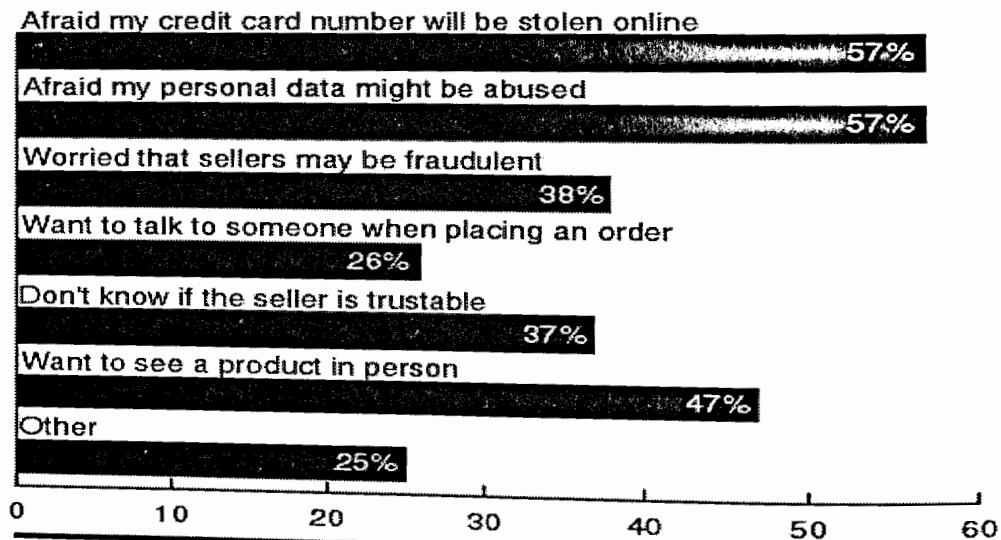
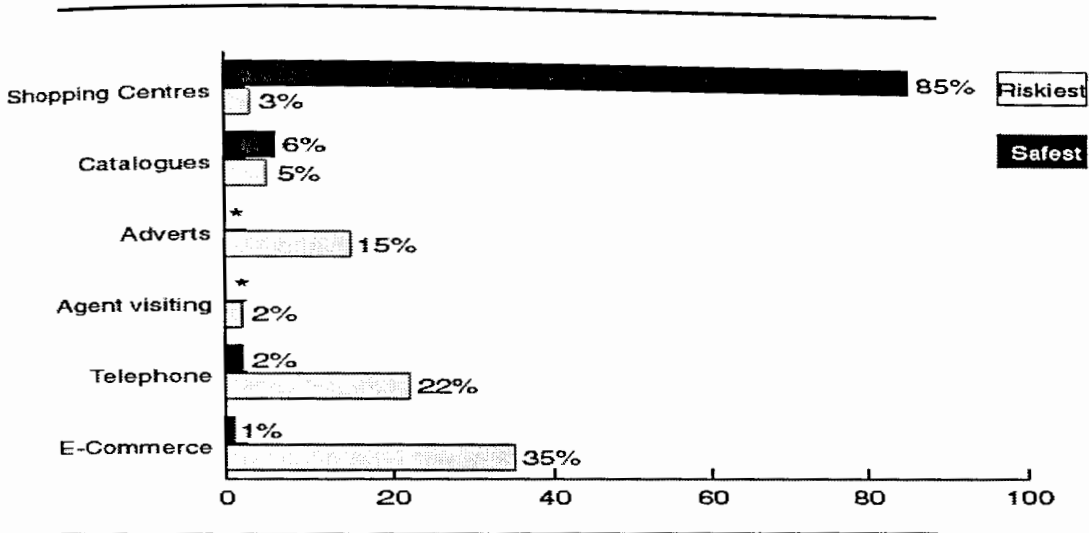


Figure 3: Consumer attitudes to Internet shopping  
 Source: Harris Interactive, August 2000.  
 Participants: 2,810 Internet users, more than 18 years old

## E-commerce and other methods of payment

As shown in Figure 3, there are many reasons restricting consumer participation in Internet shopping, such as sensitive information breach, merchant fraud, and social requirements. It can be seen that twenty-three percent of participants have never placed an order online in the last twelve months. Furthermore, forty-eight percent have ordered less than six times in one year. In such cases, trust in e-commerce is likely to be relatively low.

While the overall level of consumer confidence in e-commerce is still unclear, a survey conducted by the National Consumer Council Survey (<http://www.ncc.org.uk>) in April 2000, summarised in Figure 4, illustrates shopping methods, such as shopping over the telephone and using catalogues. Shopping centres are considered the safest shopping method.

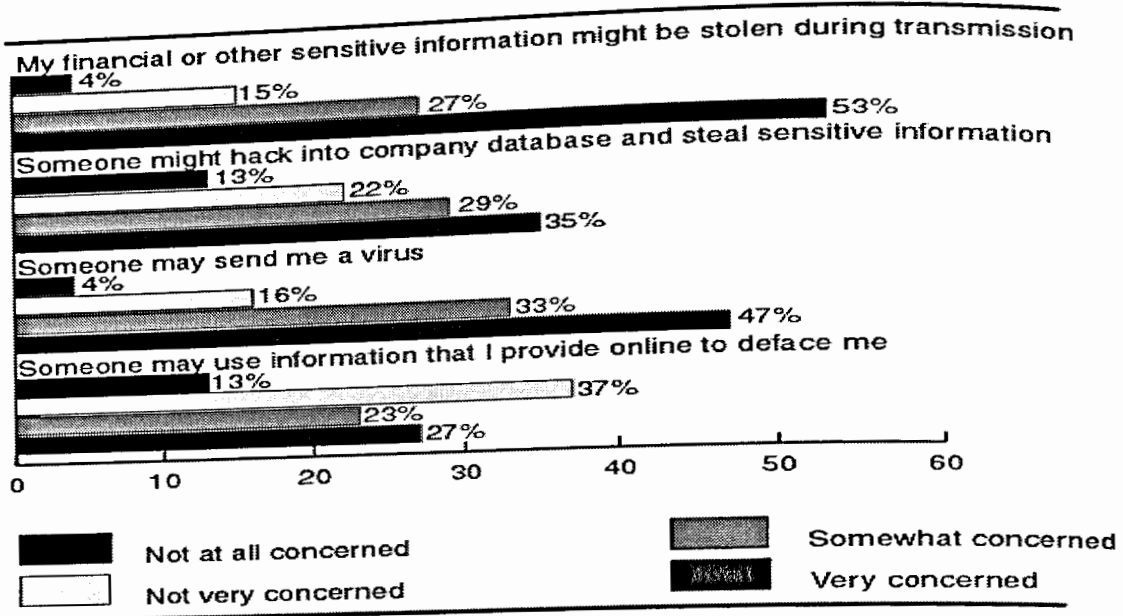


**Figure 4: Consumer attitudes to Internet shopping and other shopping methods**

Source: NCC/MORI, April 2000

Participants: all (1,950), Internet users (513)

In summary, the perceived risks associated with Internet shopping are greater than that for other shopping methods. Theft of credit card numbers is the overriding concern. Consequently, it is interesting to find out which process in online shopping consumers perceive as the most vulnerable. A survey conducted by Harris Interactive, summarised in Figure 5, also shows that the interception of sensitive information during transmission from consumer's computer to merchant's server is most commonly considered as the weakest link in e-commerce.



**Figure 5: Consumer concerns regarding Internet security**  
 Source: Harris Interactive, August 2000  
 Participants: 2,810 Internet users, more than 18 years old

From the information in the above figure, it would seem that most consumers are particularly concerned about the security of data transmission in e-commerce. This is consistent with Tomlinson (2000), who states that numerous consumers believe that security breaches occur during transmissions between clients and servers. This is despite the fact that e-commerce security encompasses a number of other aspects, including client-side security, merchant server security, application security and transaction security, (Ghosh 1998).

**Sensitive information of concern to Internet users**

In spite of the fact that e-commerce systems allow consumers to place an order directly through Internet systems, many potential users of e-commerce are hesitant to provide e-commerce merchants with their sensitive information. Friedman et al. (2000) state that lack of financial and security confidence are reducing consumer acceptance of this innovative online shopping technology. Figure 6 demonstrates what types of sensitive information are most in need of protection. Clearly, the confidentiality of credit card numbers, social security numbers, and personal financial information are of greatest importance to users.

**Other issues**

Whilst loss of personal data confidentiality during transmission is an overriding concern for consumers, there is another associated factor causing negative consumer perceptions of e-commerce. This is the inflammatory reporting of computer security incidents in the popular press. For example, instances of credit card fraud involving Internet use are often given very wide press coverage, out of proportion to their importance (Ghosh 1998).

Many information security experts argue that compromise of sensitive information in e-commerce is not likely during transmission, but through insufficient protection of merchants' web servers. According to (Caldwell 2000) in CommerceNet (<http://www.commercenet.com/research>), the theft of credit card numbers during transmission over the Internet is popularly perceived as the main concern to credit card fraud. In fact, credit card fraud often occurs at merchant web servers. This is the first example of where consumer perceptions of risk and the actual level of risk are rather different.

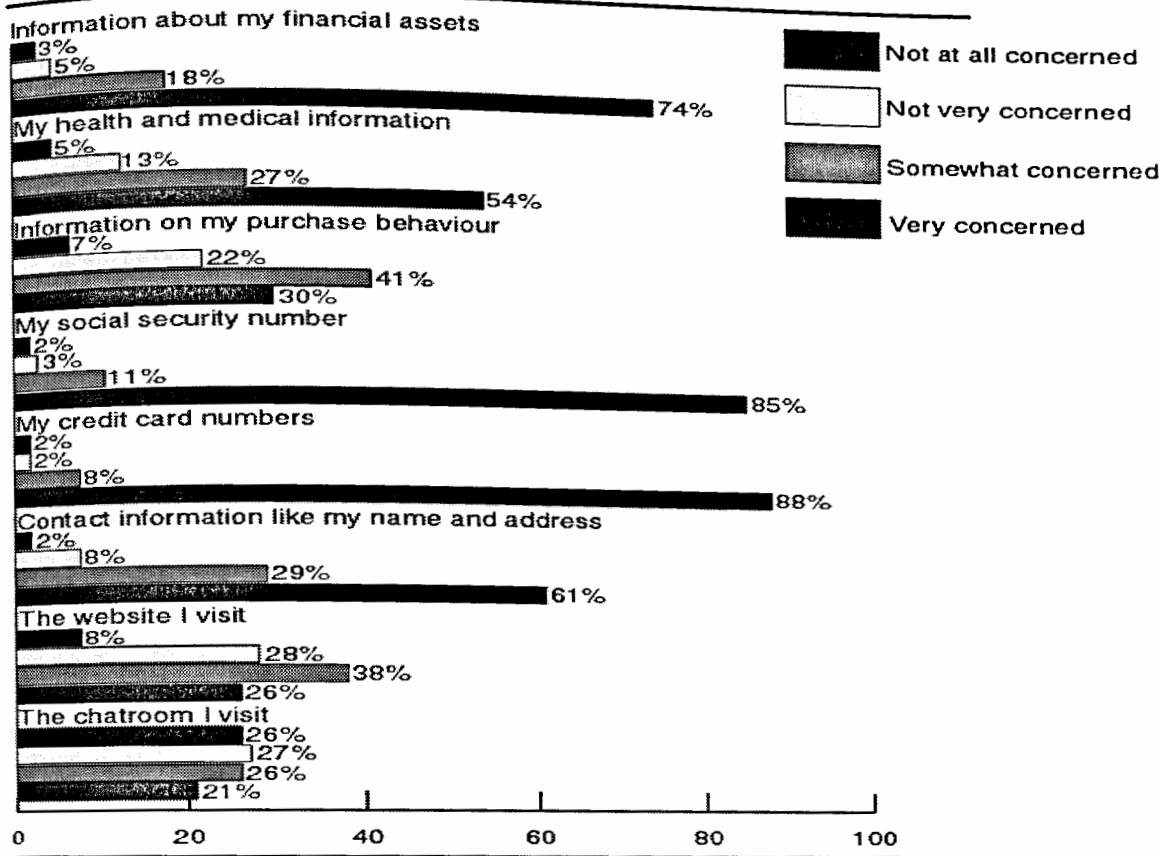


Figure 6: Consumer concerns regarding protection of information

Source: Harris Interactive, August 2000

Participants: 2,810 Internet users, more than 18 years old

## ACTUAL RISKS – CREDIT CARD FRAUD IN E-COMMERCE

We next consider the actual levels of risk associated with credit card transactions of both e-commerce and the more conventional types.

### Transaction fraud risks

We start this analysis of actual risks by considering the levels of fraud in credit card transactions. From eMarketer (<http://www.emarketer.com>) of November 2000 we learn that Visa and MasterCard report rates of credit card fraudulent transactions of 0.08% and 0.09% respectively, for all types of transaction. As far as e-commerce credit card transactions are concerned, eMarketer from January 2001 reports that of 60,320,000 online B2C transactions in 1999, only 18,600 (i.e. 0.03%) were fraudulent.

It would thus appear that the risk of fraud per transaction is actually significantly lower for online transactions than for other types of transaction. Thus one might conclude that, at least with respect to the proportion of fraudulent transactions, e-commerce is actually one of the less risky forms of commerce. In the next section we examine specific types of conventional transaction in more detail, to discover which are actually the most risky.

## **Actual risks - technology assessment**

It has been shown in the previous section that the incident rate of credit card fraud is low in comparison with conventional transactions. That is, the actual relative risks would appear to be directly opposite to consumer perceptions of relative risks. We now consider various types of transaction in a little more detail so as to understand better the real risks involved. We focus here, as throughout, on credit and debit card transactions.

In a high street transaction the retailer has access to a user's credit card for a short period of time, and therefore has the opportunity to copy all the information on the card. Moreover, the retailer will also have a copy of the transaction details, as needed for clearing and settlement, which again will contain most of the information on the card. Similarly, in a telephone transaction the retailer has access to a user's credit card number because this information must be passed to the retailer over the telephone in order to complete the transaction.

Credit card information transmitted over the Internet, however, seems to have more layers of protection in comparison with using credit cards to make payments in shops or when sending credit card numbers via telephone to place an order. According to Stein (1998), there are two main security protocols used to provide transaction security, namely Secure Sockets Layer (SSL), established by Netscape, and Secure Electronic Transaction (SET) created by Visa and MasterCard. Although both these protocols protect e-commerce transactions against potential eavesdroppers, SSL and SET work very differently. Also, while SSL is widely used, SET has not really been adopted.

During data transmission using the SSL protocol, cryptographic algorithms applicable to SSL, such as the Data Encryption Standard (DES), triple DES, and IDEA, are used to encrypt all data sent between the relevant parties (Hassler 2000). By this means, consumers are assured that their credit card numbers and other related sensitive information will be unreadable to an interceptor. SSL has different encryption key lengths varying from 48-bit to 128-bit, and its performance in securing data transmission is dependent of the lengths of the key. According to Burnett et al. (2001), 128-bit SSL encryption appears sufficiently secure to resist all attempts to break it, at least with current cryptanalytic techniques.

## **COMPARING ACTUAL WITH PERCEIVED RISKS**

### **Perceived risks**

E-commerce is perceived as the riskiest shopping method. Most consumers believe that the chance of credit card fraud in Internet shopping is high. Perceived risks in e-commerce can be summarised as follows:

e-commerce is very risky by comparison with other methods of payment;  
loss of confidentiality of credit card information is the main issue.

### **Actual risks**

By contrast, it has been shown that the credit card fraud rate in online transactions is actually low by comparison with the rate for conventional transactions. As a result, actual risks in e-commerce can be briefly summarised as follows:

Credit card fraud in e-commerce cannot happen as easily as consumers fear;  
The level of actual risk in e-commerce is indeed lower than the levels of risk perceived by e-commerce consumers.

## **DEALING WITH THE RISK PERCEPTION GAP**

As discussed above, the levels of perceived risk associated with e-commerce are very different from the levels of genuine risk. Most consumers are concerned that their credit card numbers can be compromised during transmission on the Internet. Furthermore, there is also other sensitive information, such as social security numbers and information about financial assets, for which sufficient protection is required to ensure consumer confidentiality, acknowledged as the key security goal for e-commerce merchants. As stated by Bhatnagar et al. (2000), an organisation wishing to succeed in this new business era needs to have a clear understanding of how to build up consumer confidence. In order to increase consumers confidence, it is important to consider how to deal with the difference in levels between actual risk and perceived risk (the 'risk perception gap') in e-commerce. This is the focus of the remainder of the paper.

### **Statement of consumer confidentiality**

According to the Data Protection Act of 1998 as cited in Schneier (2000: 60), 'organisations are prohibited from the collection, use, and dissemination of personal information without the consent of the person, and also have the duty to tell individuals about the reason for the information collection'. Similarly, consumers need to be assured that their sensitive information will remain private. A statement of consumer privacy must be placed in the e-commerce website in an obvious location. Consumers need to be assured that their information will not be exposed or used for any other purposes without their authorisation.

### **Techniques and tools for secure e-commerce**

E-commerce merchants must employ appropriate methods to deal with the threats jeopardising e-commerce systems. It is the responsibility of e-commerce merchants to support the latest security techniques and tools to ensure consumer confidence. For example, e-commerce merchants should use SSL with 128-bit rather than shorter keys, to assure consumers that their private information will be secure against eavesdropping by even the most determined attackers. Merchants should consider making prominent statements about the techniques and tools they employ to ensure security.

### **Reporting problems with e-commerce**

Broadcasters responsible for issuing material related to security weaknesses in e-commerce have a duty to be sufficiently well-informed to ensure that their reports are reliable and consistent with the real problems. For example, most credit card fraud cases in e-commerce occur because of weaknesses in merchant servers rather than interception of data transmission, which is securely protected by SSL or Secure Hypertext Transfer Protocol (S-HTTP) (Oppliger 2000). Broadcasters therefore need to understand the reasons for any security breaches in e-commerce, so that they can alert users to the real threats.

### **Solving the actual problem**

It cannot be assumed that consumers, who are so concerned with security in data transmission, will be comfortable with the fact that breaches of sensitive information occur at the merchant server. Information stored in merchant servers must be appropriately protected to ensure that customer confidence is not damaged by actual attacks. As a result, dealing with the risk perception gap requires the real risks to be addressed, as well as those perceived as most serious by consumers.



## **Government support**

There are numerous e-commerce merchants, and there are also many different tools and techniques employed by merchants to secure their online e-commerce infrastructure. These different techniques will have varying degrees of effectiveness in dealing with security threats, and consumers will have the problem that they have no idea how secure each merchant is. It would therefore increase consumer confidence if government regulation (and/or codes of practice) could be used to enforce minimum levels of security protection for e-commerce sites. One might envisage the development of a 'special version' of security baseline standards such as BS 7799-1 (=ISO/IEC 17799), applying particularly to e-commerce merchants. Merchants could then display prominent notices on their web sites, claiming adherence to the relevance baseline documents.

## **SUMMARY AND CONCLUSIONS**

It is clear that the level of e-commerce participation is critically dependent upon consumer confidence in e-commerce security. Many consumers fear that their financial information will be compromised due to lack of security in online shopping. Levels of perceived risk, which may increase or decrease, are determined by the levels of confidence that consumers have in this innovative business. An e-commerce organisation should focus on strategies that can build up consumer confidence, so that security and convenience are sufficient to encourage consumers to participate in e-commerce. Consumer trust in the online world cannot be separated from the future of e-commerce.

In future related research we will consider how effective existing security schemes for e-commerce transactions (notably SSL and SET) are in addressing consumer concerns. This will lead to a better understanding of how best to approach e-commerce security issues from the perspective of promoting greater consumer involvement in e-commerce.

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# Justifying Investments in Electronic Commerce

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## ABSTRACT

*This paper explores why organizations invest in eCommerce applications and highlights some of the expected returns. A Delphi study was used to determine the underlying benefits of eCommerce investments and several formal financial and non-financial approaches to justification are identified and discussed. A framework is outlined which can be used to select a justification approach based on the aims of the project and the type of values and benefits expected. Attaining competitive advantage and developing new business opportunities were identified as factors that could be best justified using strategic or analytical approaches rather than financial justification.*

*Keywords: electronic commerce, benefits, investment justification*

## INTRODUCTION

A recent article by Goett (2000) compares embarking on an eCommerce (EC) venture with the movie Raiders of the Lost Ark:

*'Indiana Jones faces an unexplored Inca temple. While he has a map of the temple's location, he has no plan of its interior. No one before him had escaped that temple alive. Indy has to dodge flying spears, falling guillotines, and rolling boulders in his quest for the prize. The remains of his unlucky predecessors give him a clue of their fate, and he uses all his skills as an experienced archaeologist to identify likely traps. He manages to escape with the treasure because he is bold, fearless, and knowledgeable. He is also very, very agile.'*

Today, in uncertain economic times, managers face increased pressures to make sure that eCommerce investments have certain paybacks but in the race to be first to grab the prize they face pitfalls and traps that can mean certain financial death. In the dash to establish dominance in new markets, being first is sometimes seen as more important than doing it well. One CEO of a major corporation recently said that he approved a seven-figure budget request from the firm's Director of eCommerce in less than ten seconds because being first to market in the industry was a non-negotiable imperative. Yet ignoring formal justification of any investment has too often been a recipe for disaster.

Justification forms the basis on which decisions are made. It refers to any financial and non-financial approach, and should be interpreted in the broadest possible context, i.e. any method, process, procedure, technique etc. Remenyi *et al* (1997) illustrates this by suggesting that justification assists in understanding the impact of the change that an investment has on an organisation. As stated by Silk (1991) 'Managers direct resources to achieve results'. However, the fundamental question is which investment will achieve these goals and how can the outlay be supported by a justification methodology. Organisations need to be able to set aside the hyperbole and consider how an investment will benefit their business processes, and thus determine whether the money spent is actually being wisely spent.

## RESEARCH OBJECTIVES

The main objectives of this research were:

- To investigate the *benefits* of investing in EC applications;
- To highlight the *justification approaches* that best capture the issues regarding EC investments.

The first objective examines the various reasons as to why organisations invest in EC, to determine the benefits that they expect to attain and impediments they expect to avoid. These elements lay the foundation for what a justification approach must highlight, that is both tangible and intangible reasons.

The second objective was to develop a framework that captures the issues raised in the first part of the study. There are numerous justification techniques that are variations of other techniques, these can be altered to suit varying purposes, yet there is no suggestion of the reliability or suitability of these for justifying EC applications. This aim concentrates on analysing the various approaches and identifying where and how they can be used to justify EC investments.

## APPROACHES TO JUSTIFICATION

Approaches to IT investment justification have been proposed by Earl (1989), Irani (1999) and Wen and Sylla (1999). Earl proposed the use of a four-way framework to formulate appraisal techniques for different purposes (see Table 1). The approach addresses organisational intentions and goals to be derived from using IT. The nature and characteristics of these goals are then determined in terms of tangibility, risk, judgement etc. Users are referred to suggested approaches/techniques that can be used to appraise investments.

Aim	Goals	Nature	Approach
Productivity and performance	Efficiency Effectiveness	Tangible benefits Clear argument	Financial Net present value
New ways of managing	Change Flexibility	Radical concept Multi-dimensional	Multi factor Metrics
Competitive advantage	Product-market positioning Competitive disequilibrium	Concrete vision Commercial judgement	Strategic analysis Tests
Developing new business	Diversification Growth	Business venture Risk and uncertainty	Business case Business plan

**Table 1: Earl's four-way framework**  
(Adapted from Earl, 1989)

Wen and Sylla (1999) took a slightly different approach by recognizing opportunities and threats of failure, classifying evaluation methods in terms of tangibility and risk. They argue that benefits are lost through inappropriate management and lack of recognition during planning, thus should be identified and measured prior to selecting a justification approach. Risk should also be taken into consideration to recognise uncertainty of the future. The analysis somewhat reiterates Earl's four-way framework in that it identifies benefits and links them to the various justification approaches identified.

Neither Earl nor Wen and Sylla identify any specific approaches to eCommerce justification so this was one aim of our study.

## RESEARCH METHODOLOGY

The Delphi technique (Linstone *et al*, 1975) was used in this study because of its ability to aggregate individual ideas. Participants were invited to put forward their experience and knowledge anonymously in their own time and benefit from the results. Willingness and motivation to participate was high because organizations have experienced difficulty in justifying their EC applications and were eager to find answers. Delphi sets aside any predetermined thoughts influenced by the literature and seeks to identify results based on what is experienced in the real world. The underlying benefit of the Delphi technique is that both the respondents and the researcher can gain a valuable insight into an issue as it comes to conclusion. A diverse body of knowledge and ideas are independently brought together and analysed by experts whom in turn learn off each other.

The study took place over four months, and consisted of three rounds of questionnaires which can be summarised as follows:

Round 1: *Identifying* the justification approach(es) used to highlight the issues regarding investments in Web applications.

Round 2: *Ranking* the justification approach(es) used to highlight the issues regarding investments in Web applications.

Round 3: *Seeking consensus* on justification approach(es) used to highlight the issues regarding Web investments.

The series of questionnaires began with a fairly broad question concerning problems, objectives, solutions or forecasts. Succeeding questionnaires are then based on the responses of previous questionnaires, and the process continued until a consensus was reached.

The first questionnaire requested a brief description of the reasons why each organisation decided to invest an application on the Web. These factors may be internal and/or external to the organisation, such as to attract customers, improve competitive advantage, improve performance and productivity, for expansion and growth or to improve management. It also requested a brief description of what financial and non-financial techniques were used to show adequate grounds for proceeding with the investment. The intent of the broad scope of the initial questions was to allow participants to respond open-mindedly and respond without prejudice.

The second questionnaire was short enough for the respondents to review, criticize, support, or oppose (Delbecq, *et al* 1975). It was more restricted and asked the participants to review the benefits and techniques identified in the first questionnaire and argue in favour of or against the benefits and approaches identified. The aim was to help participants understand each other's position, introduce different ideas and to move toward accurate judgements concerning the relative importance of the benefits and techniques.

The selection of participants was based on organizations that were involved in investing in EC applications, from well-developed and fully functional sites to yet to be developed sites.

## **FINDINGS**

All participants were able to adequately answer the section regarding the benefits, identifying a total of 31 different benefits. Each participant actively took part in identifying and commenting on the benefits of investing in EC applications. The section on justification on the other hand was somewhat more complex, emphasizing the difficulty of justification. A total of eight different justification approaches were identified. Each approach had a varying number of corresponding issues supporting their appropriateness to EC applications.

## **MAIN REASONS FOR INVESTING IN WEB APPLICATIONS**

These are discussed below in terms of achieving competitive advantage, expansion and growth effects, and improving productivity and performance.

### **Competitive Advantage**

#### **Providing access 24 hours a day, 7 days a week**

The main reason influencing organisations to invest in EC applications was perceived to be the ability to provide access to information and service 24 hours a day, 7 days a week. This reason was ranked highly by 80% of participants. Comments suggested that constant accessibility and greater access provided by EC applications assists in achieving customer satisfaction.

#### **Effective promotion of the organisation together with the products and services it produces**

The Web was viewed as an 'adjunct to existing marketing', allowing consumers to learn about the organisation at a time that suits them with the 'potential to increase awareness and sales'. This was selected in the top ten by 78% of participants.

#### **Enhance quality and speed of customer service**

Deemed important by 67% of participants. The argument put forward was that 'if the customer isn't satisfied with the experience, why do it'. It was also noted that unless it was developed properly it would be detrimental to the organisation.

#### **Create competitive advantage and subsequently avoid competitive disadvantage**

Selected by 67% of participants, the argument was that EC applications extend the opportunity to improve competitiveness. Niche markets in particular benefit from such opportunities. One participant raised the issue of there being 'no second places in the WWW world'.

#### **Entice shoppers and encourage customer interaction**

EC applications are considered to be an 'adjunct to existing marketing', allowing people to anonymously interact with the organisation and potentially increase sales. It also takes a new approach to attracting customers. Other forms of marketing generally search for the customer, whereas with the Web, it is the customer that does the searching.

#### **Bandwagon effect**

Although only one participant selected this as most important, it did attract an interesting discussion. One participant felt that although the 'everyone else is doing it argument' is true; it does not allow the organisation to control its future. Other participants felt it was more important for an organisation to 'evaluate whether the company is ready and able to participate', reiterating the importance of justification.

## **Expansion and Growth Effects**

### **Supporting core business functions**

It was suggested that 'unless a web presence is part of a wider business strategy, it will be unlikely to survive'. Others felt that growth took time so investing in and refining EC applications led to benefits in future years.

### **Providing new business opportunities and exposure to new untapped market niches**

The argument was clear that EC applications offer the 'opportunity to create markets' that are more accessible than the traditional economy. Such opportunities were then related to the issue of potentially increasing profits. This was selected in the top ten by 73% of participants.

### **Increasing market presence**

Selected by 53% of participants, increasing market presence was deemed to create awareness of products and services.

## **CREATING A CORPORATE PRESENCE**

This simple act of creating an Internet presence was said by 47% to 'create awareness' of the organisation itself.

### **To facilitate on-line purchasing and generate revenue from electronic sales**

Perhaps one of the most interesting results was the relatively low ranking given to generating more sales. Only 40% of participants regarded this as one of the top 10 benefits. Although one participant described it as an 'an extra revenue stream', it was not deemed to be as important as simply attracting customers to the organisation.

### **Accessible research tool**

Selected by 40% of participants, EC applications were regarded as time and money savers in that they assist in doing things quickly, efficiently and at a lower cost. It led to more 'educated customers' since the accessibility and ease of use of EC applications, allowed them to study what was on offer.

### **Improving management and business processes**

Improving internal and external communication and timely access to key stakeholders (i.e. suppliers, customers) and improved internal business processes were seen as key benefits of Web investments. One participant regarded improving business processes as a 'critical change catalyst'.

### **Improving Productivity and Performance**

Benefits supporting productivity and performance goals were considered to be the least important factors influencing organisations to invest in Web applications. Reducing operating costs was selected by only 40% of participants, suggesting that Web applications assist in lowering transaction costs in comparison to other alternatives but this is not the main reason for the investment.

Ease of use was considered important in that in order to ensure success people need to feel comfortable and accustomed to Web use. Improving productivity and morale among employees was initially suggested to be of benefit, yet based on later comments, appears minor in comparison to the other benefits suggested.

## APPROACHES TO JUSTIFYING WEB APPLICATIONS

Approaches to EC justification identified in the survey provided interesting results, particularly when comparisons are made with the IT literature. The main approaches identified were:

### **Critical Success Factors (CSF)**

CSF was seen to be an important justification method by 87% of participants. The approach highlights strategic issues such as ensuring that the organisation remains competitive and providing improved customer satisfaction by the use of better technologies. The approach can be tailored to identify vital time dependant factors crucial to success.

### **Cost Benefit Analysis (CBA)**

CBA was selected in the top 10 by all but one participant. However, it was suggested that the value of reducing costs and achieving revenue growth changes over time so these aspects are difficult to quantify. At the outset several participants felt that CBA was the most effective justification model but as other models were raised by study participants views changed.

### **Return on Investment (ROI)**

Analyses tangible benefits minus costs and is based on the assumption that investing today will reap returns over future periods. It was accepted that traditional ROI calculations "may yield simple answers yet create long term problems". ROI was selected by 60% of participants. However, questions were raised as to how cost savings could be accurately measured using this approach.

### **Payback Period (PB)**

Examines the length of time it takes for an investment to recover the initial outlay. This approach was considered "simple and easy to calculate and understand", which is why it is readily used. On the other hand, participants felt that highlighting savings that cover set up costs is only a small part of justification and does not accurately reflect long-term investment potential.

### **Net Present Value (NPV)**

NPV is used because it compares costs and savings in today's terms. However, few positive comments were made regarding this approach because it was perceived to be built on "faulty assumptions" such as estimating future profits, taxes, inflation and deciding on which discount rate to use.

### **Information Economics (IE)**

IE (Parker *et al.*, 1988) emphasizes the necessity of dealing with justification problems by defining the value of information to an organisation. It includes value linking, value restructuring, value acceleration, and innovation evaluation. IE was said to be useful in identifying then evaluating, scoring and ranking all potential positive and negative factors associated with a project and therefore the raising awareness of key stakeholders about issues concerning the evaluation process.

### **Balanced Scorecard (BS)**

The BS approach (Kaplan *et al.*, 1996) was considered relatively important for communicating vision and strategy (60%) and "supplementing traditional measures" by taking into consideration customers, business processes, learning and growth. It was also suggested that this approach can be used to identify actions an organisation can take to improve performance.

### **Value Analysis (VA)**

VA assists in judging which intangibles are of greater value to the organisation. Participants using this approach suggest that it 'improves communication between analysts and users', when judging what was of value to the organisation. In addition, it was said that due to the ability to change what was meant by 'value', justification could be tailored to suit every organization and investment individually.



## **A CLASSIFICATION SCHEMA**

In general, it was found that the justification methods typically fall into four groups. These are:

Strategic techniques which view the long-term impact of the organisation taking into consideration both tangible and intangible factors, which ultimately lead to competitive advantage.

Analytical approaches which are highly structured incorporating risk into the analysis, and relate to developing new businesses with growth and diversification.

Integrated approaches which combine subjectivity with formal structures to integrate financial and non-financial techniques, focusing on the organisation itself in terms of the way it operates.

Financial techniques which relate to structured valuations of tangibles, that in essence have been deemed appropriate to productivity and performance.

In Table 1 we have classified the types of benefits that organizations have derived from EC applications and compare these against possible justification methods. The framework may not be applicable to all organisations, yet it does give an indication as to what is possible.

<b>BENEFITS DERIVED</b>		<b>Issues Highlighted</b>	
Aim: Competitive Advantage		<b>APPROACH: CRITICAL SUCCESS FACTORS</b>	
Provide 24 hours/day 7 days/week access	S T R A T E G I C	Competitiveness	
Effective promotion of organisation, products and services		Timely service	
Enhance quality and speed of customer service		Greater exposure	
Create sustainable competitive advantage		Access to new markets	
Entice shoppers and encourage customer interaction		Need to have a Web presence	
Bandwagon effect		Creating widest possible user base	
To keep up with trends in technology		Promotion	
Aim: Expansion & Growth		<b>APPROACH: VALUE ANALYSIS</b>	
Support core business functions / Integral to business strategy, long term vision and goals	A N A L Y T I C A L	Assists in judging which intangibles are of greater value to the organisation	
Provide new business opportunities and exposure to new untapped market niches		Emphasises value rather than cost	
Increase market presence			
Creating corporate / Internet presence			
On-line purchasing / generate revenue from eCommerce sales			
Accessible research tool			
Levelling the playing field – globalisation, expand market place			
The Web is seen as the way of the future			
Interlinking – providing relevant links to other sites			
Aim: Improve management & Business Processors		<b>APPROACH: BALANCED SCORECARD</b>	
Improve internal and external communication with key stakeholders	I N T E R O R G A N I S A T I O N A L	Communicates organisational vision and strategy	
Improve internal business processes			
Improve internal communication by providing organizational information to all staff			
Timely marketing information and sales			
Timely information retrieval and utilization (accuracy & reliability)			
Facilitate remote interaction with video capture interface			
Aim: Productivity & Performance		<b>APPROACH: COST BENEFIT ANALYSIS</b>	
Reduce operating costs	F I N A N C I A L	Illustrates how information and service can reduce delivery time and cost	
		<b>APPROACH: RETURN ON INVESTMENT</b>	
		Identifies how the use of technology achieves significant cost savings	
	I A L	<b>APPROACH: PAYBACK PERIOD</b>	
		Illustrates how savings in support costs cover set up costs	

**Table 1: A Framework for Justifying EC applications** (Adapted from Earl, 1989 and Irani, 1999)

## CONCLUSIONS

As suggested in the management literature, the main reasons for investing in EC applications can be attributed to gaining intangible benefits. The findings of this survey heavily support these claims given that the main tangible benefit identified related to reducing operational costs such as marketing expenses or transaction fees.

Surprisingly, the majority of reasons for investing in EC applications produced non-quantifiable returns and yet the majority of most appropriate approaches to justification were financial, requiring quantifiable data. It appears that there is a degree of confusion as to whether the financial approaches can be appropriately used to justify EC applications. It was evident in both the literature and the findings that many benefits can be derived from investing in EC applications. The benefits that were identified in the findings emphasised the nature and importance of these benefits. Such benefits were then attributed to Earl's four-way framework that broadly attempts to link organisational aims to justification approaches. The benefits that were considered to be of most importance were those concerned with competitive advantage and expansion and growth of the organisation, in particular, providing information access 24 hours a day 7 days a week and supporting core business functions. Productivity and performance benefits on the other hand appeared to be of least importance.

In terms of the justification approaches, very few approaches were identified in comparison to the extensive range identified in the literature. In particular the traditional cost benefit analysis was by far the most popular as it highlighted how information and service can reduce delivery time and cost. It appears that the most appropriate form of justification is to determine factors deemed essential to the survival of the organisation, which reiterates the importance of strategic thinking. The well known cliché suggesting that one cannot manage what cannot be measured, still demonstrates the importance of understanding where and how money is being used, and what benefits an investment is expected to generate.

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# How Intimate are Australian Retail Supply Chains?

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## ABSTRACT

*The adoption of electronic commerce strategies is becoming an important means of assisting industries, and indeed whole economies, to gain significant net benefits. The extent to which eCommerce-based strategies, such as quick response and efficient consumer response, might have an effect on local economies depends in part on how readily they are being adopted. The dominant form of adoption of these strategies is to be found in the business-to-business forms of eCommerce. To be successful, all business partners must be in a position to share data. This paper presents the initial results of a national survey completed in the retail sector of the Australian economy, that assesses how well Australian industry is responding to the eCommerce challenge.*

*Keywords: quick response, efficient consumer response, EDI, customer intimacy, collaborative planning & forecasting, replenishment*

## INTRODUCTION

Two independent reports prepared for the Australian Government (National Office for the Information Economy, 1999) and the European Commission (EC) (FAIR Project Consortium, 1998) outline many of the potential net benefits that the Australian economy and countries within the European Union (EU) could gain from the adoption of eCommerce strategies. These reports are significant, because they attempt to assess the impacts of the adoption of eCommerce on various sectors of each economy. In particular, they examine the likely macroeconomic effects from the continued rapid expansion of eCommerce by examining contributions to growth in output and consumption, in employment and productivity, to the economies of two quite different regions.

Both reports agree that there are generally potential positive multiplier effects and new job creation consequences. The EU predicts that even taking into account direct substitution effects and traditional job reductions, the indirect multiplier effects on production, value added and employment growth is 'three indirect jobs for each direct job created' (p2). It further estimates that revenues of 58 billion ECU are possible by 2001. Much of the revenues will be generated from 'introducing a new, richer dimension of interaction within supply chains and in seller-buyer relationships. New intermediation, rather than dis-intermediation, represents the largest source of new business opportunity' (p2).

The Australian Government report, which focuses on the structural changes that eCommerce may bring, suggests that the widespread adoption of eCommerce predicts that the more efficient way of doing business (*online*) will result both directly and indirectly in net benefits. The simulation studies conducted as part of the project, suggest that 'the net impact could be a 2.7 per cent increase in the level of national output, and enhance consumption (a better indicator of material wellbeing) by about \$10 billion within the next decade' (p2).

Both reports agree that the contributions to growth will initially be made in the business-to-business domain of eCommerce adoption. Initially, this will be the domain that will gain the most from improved efficiencies through reduced costs and prices and improved business practices.

This paper presents the results of a national survey conducted in Australia of organisations that have undertaken eCommerce activities primarily in the business-to-business domain of the Australian retail sector using QR and ECR strategies. The results presented in this paper provide additional insights into earlier work by Harris and Swatman (1999) Harris *et al.* (1999) and McMichael, *et al.* (1997, 2000) who concentrated on the effects of adoption of efficient consumer response (ECR) strategies in the Australian grocery industry and quick response (QR) in the Textile Clothing and Footwear industries respectively.

This survey was completed during 1999, covering companies who are mostly suppliers to much larger retail customers. Where available, results are compared with those from an international report prepared by Kurt Salmon Associates (Kurt Salmon Associates, 1998). This comparison allows the Australian retail sector to gauge how successful it is in comparison with the available US results.

## ECOMMERCE AND THE AUSTRALIAN RETAIL SECTOR

Quick response (QR) is a business strategy enabled by IT to improve communication and coordination between supply chain partners. By its strategic nature, QR creates a business opportunity that seeks to achieve an alteration to existing business practice (Hadjiconstantinou, 1998). QR has also been called the retail industry's version of just in time (JIT) manufacturing because it seeks to better manage and move inventory through the supply chain. A related strategy is efficient consumer response (ECR) which was originally based on QR, but specifically applies QR principles to the grocery industry (Harris *et al.*, 1999).

QR, ECR and JIT aim to keep inventories as low as possible, without goods running out, and to quickly resupply goods as they are needed to prevent *stocking out*. QR and ECR extend beyond the paired relationships that are often found in JIT manufacturing by creating partnerships that extend to all levels of the supply chain. While existing views of QR have been adequate for focusing on particular aspects of QR arrangements they often overlook some of the essential elements required when QR is seen as a total business strategy.

One of the key drivers of this business strategy is the degree of competition being experienced by global firms. Strader *et al.* (1999) stress that it is this intense competition in most industries that is making organisations look toward better ways to improve product quality, customer service and operating efficiency, just to remain competitive. QR and ECR are two of the business outcomes firms have used to meet the competitive challenge.

## RELATED PRIOR RESEARCH

There are many definitions of QR and ECR. The preferred definition for this study is:

QR (and ECR) is a consumer driven business strategy of cooperative planning by supply chain partners, to ensure the right goods, are in the right place, at the right time, using IT and flexible manufacturing to eliminate inefficiencies from the entire supply chain.

This research focuses on the cooperative, computer based communication aspects of QR and ECR which, as Zwass (1998) describes, form part of a hierarchical structure of eCommerce levels, which includes partnerships (business relationships), IT and information sharing. In Zwass's terms, we reflect his meta-level of products and structures (Level 7) which relates directly to interorganisational supply-chain management.

A US study in 1986 examined the flow of products in the supply pipeline from raw materials into textiles, to apparel, to retail and finally to the consumer. The results of the study (see Blackburn, 1991), showed that it took on average 66 weeks to move from a raw material to a finished good distributed to the consumer, as outlined in Figure 1. A \$25 billion efficiency loss was estimated to be occurring due mainly to forced markdowns, discounting, stock outs and increased carrying costs for excess inventory. Forecasting problems affected the industry because the span of the forecasts in the product pipeline extended beyond a year. All parties could only estimate what goods the consumer would demand by the time the product reached the market.



**Figure 1: The Apparel Pipeline**  
Source: Blackburn (1991)

Blackburn (1991) reports that the initial study suggested that forecasting could be improved in two ways. First, by increasing the accuracy of planning systems and second, by reducing the time between making the forecast and the actual event occurring. It was thought that while the accuracy of planning could be improved, the greatest gains could be attained from taking time out of the supply pipeline—to move the stock forecasting decisions closer to the customer in time. By eliminating the slack time, the length of the supply pipeline could be reduced, which would decrease the level of uncertainty in the decision making process, because forecast error decreases in proportion to the time until the event. As a result *pipeline acceleration* was born.

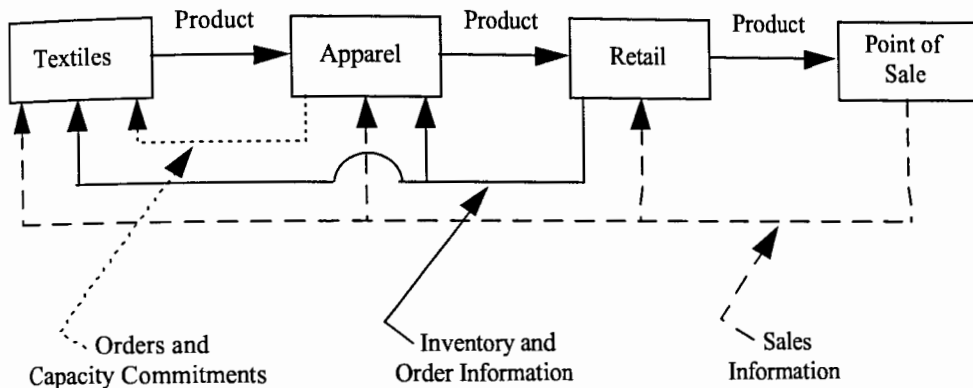
The introduction of universal product codes (UPC) and point of sale (POS) scanning in the mid-1980s made it possible for retailers to track product movements themselves at both the distribution centre (DC) from incoming and outgoing receipts and at the store level from POS scanning. At the same time EDI networks were being established between retailers and their suppliers and some manufacturers were establishing EDI with their suppliers. Clemons and Row (1993) found that the adoption of EDI by retailers and their suppliers had led to short term benefits, due mainly to administrative savings, where EDI was used to automate existing document exchanges. Clemons and Row concluded that the potential existed to achieve greater savings using EDI to restructure the logistics system to reduce costs.

The availability of detailed information collected at the POS coupled with EDI made it possible to disseminate sales data throughout the supply chain as shown in Figure 2, where sales data flows back down the supply chain from the point of sale.

Using QR, the flow of products and the flow of information in the apparel pipeline are both increased in velocity. Goods are moved forward to the customer faster by reducing manufacturing and shipment times, and by eliminating inefficiencies that are not beneficial to the supply chain as a whole. Allowing this faster flow of goods to occur is the increased responsiveness available through faster communication of consumer preferences back to all members of the supply chain using computer-based communication systems.

This research paper presents some initial results of a national survey of the extent of eCommerce (particularly the adoption of QR and ECR strategies) in supply firms within the Australian retail supply chain. The paper concentrates on the issue of process improvement, and includes the issues of:

Consumer intimacy  
Collaborative planning and forecasting



**Figure 2: Two Way Product and Information Flows in the Supply Chain**  
Source: Blackburn (1991) Stock replenishment eCommerce support

### AUSTRALIAN RETAIL SURVEY

This national survey was conducted between March and June 1999. To make the survey internationally comparative, the Kurt Salmon Associates (1998) survey was used. The survey instrument itself was modified to reflect the Australian retail industry's use of local terms. Two separate questionnaires were sent to the quick response/eCommerce coordinator of each supply company (50 questions) and each retailing organisation (39 questions). This paper reports only on the supplier survey.

The targeted population was confined to suppliers to the Australian retail sector that were trading electronically with at least one customer. All suppliers included in the survey were trading electronically with their customer base that included the largest retailers in Australia (including Coles Myer group, Woolworths and Big W). Approximately 1,500 companies were identified from a list of suppliers provided with the assistance of the Australian Retailers Association. The effective response rate was 11 per cent.



A profile of these companies is illustrated in Table 1

**Table 1: Profile of retail firms**

Category	Frequency (No)	Per cent %
Clothing and footwear	3	1.8
Appliances/consumer electronics	9	5.6
Books/audio/video	9	5.5
Packaged/consumer goods	48	29.4
Hardware/home improvement	13	8.0
Sporting goods	8	4.9
Textiles and fabric	10	6.2
Health and beauty aids	16	9.8
Furniture/home furnishings	9	5.5
Non-perishable food and beverages	15	9.2
Perishable food and beverages	10	6.2
Other	13	7.9
<b>TOTAL</b>	<b>163</b>	<b>100</b>

A profile of company turnover is illustrated in Table 2

**Table 2: Turnover of retail firms**

Turnover (\$ million)	Frequency (No)	Per cent %
< \$5 million	57	34.9
\$6–10 million	25	15.3
\$11–25 million	33	20.2
\$26–50 million	15	9.2
\$51–100 million	12	7.4
\$101–200 million	6	3.7
\$201–500 million	7	4.3
\$501 million – \$1 billion	3	1.8
Not reported	5	3.2
<b>TOTAL</b>	<b>163</b>	<b>100</b>

## RESULTS

### Customer Intimacy

The term *Customer Intimacy* is now used to suggest that suppliers need to develop intimate partnerships with customers to differentiate themselves from competing suppliers. The aim is to turn a satisfied customer into a loyal customer. Customer intimacy highlights the ability to understand and respond to highly specific and changing needs of very specific customers by continually tailoring products and services to precisely meet those needs.

Information systems give clues to customer preferences but Wiersema says that a human touch is required in learning what people really want (Wiersema quoted in Klinkerman, 1999). He points to three major customer priorities. The first is transparency where you must make customers feel that you are being accurate, reliable and responsive to their needs. The second is distinctiveness where you must give them a clear and compelling reason to choose you over other alternatives. And the third is leadership, where customers love to associate themselves with winners and companies that are going places. The degree of customer intimacy was measured by the extent of shared data between the customer and the supplier. In particular, the extent to which POS data from customers is shared with suppliers.

Fifty two per cent of suppliers who were trading electronically were given access to POS data from their major customers. This represented on average 32 per cent of their total sales. Kurt Salmon reported that in the US in 1998, the comparable figure was 79 per cent with access to POS data. Interestingly, about one third of suppliers

were using a data warehouse to store the data received from customers. Table 3 illustrates the type of data maintained by suppliers with a data warehouse.

**Table 3: Type of data stored in data warehouse**

Data type	Australian Survey 1999 per cent	Kurt Salmon 1998 per cent
Own products	32.5	–
Category data	13.5	33
Promotion/in-store display history	11.0	14
Store demographics	6.1	14
Market basket data	4.3	8

### Collaborative Planning and Forecasting

Collaborative planning and forecasting is a set of business practices based on shared information and planning among partners. It consists of an established set of business practices that trading partners agree to follow. Its success depends on the partners sharing information and forecasts, usually via the Internet and electronic data interchange (EDI), to more accurately replenish shelves. Everyone involved in collaborative planning and forecasting agrees that its impact will be dramatic. Still, the concept will require not only trust in partners, but also an investment in the technology that will allow disparate systems to communicate fluently.

The ability to form new relationships between supply chain partners to eliminate inefficient practices and accelerate the flow of goods through the supply chain is the goal of QR and ECR efforts. Increasing the level of customer intimacy and joint planning are one of the keys to achieving that goal. Suppliers were asked the extent to which they developed seasonal forecasts with their key retail customers. Approximately 43.4 per cent indicated they do not participate in preparing seasonal forecasts at all. Of the remaining 57.6 per cent who are involved in seasonal forecasts, the modal class represents between 10–30 per cent of customers.

It is very significant to note that 2 out of 5 suppliers were not actively preparing seasonal forecasts with their customers. This further underlines the troubling finding of Harris *et al.* (1999) that although there is quite a lot of interest in the QR and ECR supply chain initiatives there is a general lack of interest from suppliers in implementing the complete strategy. Respondents were asked whether their larger customers provided forecasts. Only 14.5 per cent reported any forecasts, although a few stated that they had plans to receive data within three years. They were also asked if they set joint goals with formal metrics with their key retail customers. Table 4 presents the results of the formal metrics used by suppliers.

**Table 4: Metrics used by suppliers**

Formal metrics	Per cent using %
Sales goals	71.8
In-stock goals	44.8
Goals related to mass customised product	3.7
Profitability goals	25.8
New product success goals	18.4
Goals related to electronic sales of merchandise	6.1
Inventory turns goals	20.9
Total lead time goals (from product concept to on the selling floor)	20.9
Consumer satisfaction goals (from product concept to on the selling floor)	20.2
Fulfillment objectives	18.4

### Stock Replenishment

Efficient retail replenishment is the single largest opportunity existing in the supply chain today (Williams, 1999). Many organisations are suffering from the dual problems of being out of stock at the shelf in some products and simultaneously having excessive inventories in retail stores in other products.

Consumers initiate the QR process of replenishment when they make purchases from the retail store—these purchases are expressions of their needs and wants. These needs and wants are recorded by the retailer as merchandise information usually by size, style, colour and brand from point of sale scanning.

There are three main ways in which a replenishment order can be generated from the POS data. The retailer may give the supplier a blanket type authorisation to prepare and ship orders as per agreed methods, without any review of individual orders by buyers. This is the vendor managed inventory (VMI) approach most commonly used by discount retailers and their suppliers. The extent to which this information is requested and used depends on the size of the supplier. Generally, large suppliers request this type of information and prefer to perform their own analysis in a vendor managed inventory (VMI) system, while smaller suppliers only want aggregated sales information.

The second approach involves the supplier preparing an order and then sending it to the retailer electronically as a reverse purchase order. Under this system the retail buyer reviews and approves the recommended quantities and makes any modifications if deemed necessary. While this approach takes more time than the VMI approach, it allows the retailer to make changes based on information that the supplier may not be privy to, such as rival's products being on promotion.

The final approach involves the retailer preparing replenishment orders using in house software and data analysis systems and then transmitting these orders, via EDI, to the suppliers. Some retailers that prepare their own orders still share their POS data with their suppliers to give the suppliers a better basis for sales forecasting and production scheduling. Customers are keen to maintain the absolute minimum level of inventory possible, subject to being able to maintain sufficient product to meet the demands of consumers. Too large an inventory will result in excessive holding costs, while frequent out-of-stock occurrences will result in missed sales.

The main benefits of the VMI approach are that inventory levels (especially safety stocks) can be significantly reduced and the risk of stock-outs is consequently reduced. This benefits both the retailer (lower holding costs and elimination of purchase order transactions) and suppliers (advanced warning of stock demand makes production requirements far more predictable) (Christopher, 1998).

McMichael, *et al.* (2000) found that improved planning had resulted from QR through increased information sharing from the elimination of 'slack time' which had occurred due to retailers withholding information. However this acceleration had only occurred in the first link of the supply chain between retailers and manufacturers and did not extend beyond this first tier. The demands by retailers to make smaller more frequent deliveries, the increased distribution costs incurred and the infancy of automated replenishment programs were cited as reasons why the accelerated movement of goods hadn't flowed back through the supply chain.

Responding suppliers reported that 59.7 per cent were participating in automatic stock replenishment programs with their customers, 27.2 per cent indicated they had no intention of participating in such a scheme. The remaining 13.1 per cent had plans to introduce automatic replenishment within three years.

The finding that just over one quarter of the suppliers surveyed had no intention of participating in automated stock replenishment was surprising given that McMichael, *et al.* (2000) had found that firms participating in QR had strengthened their competitive position compared to those firms which were not participating in QR. The small size of the respondent firms, 50 per cent with a turnover of less than \$10 million, and the retailers decision to concentrate on automated replenishment with large volume suppliers help to explain this finding. However, this finding clearly illustrates that eCommerce activities have not fully penetrated the retail supply chain and perhaps are unlikely to in the near future. This does call into question just how quickly some of the predicted benefits suggested in the EU and Australian Government reports will be realized and if these benefits will be partially offset by the incomplete adoption of eCommerce by smaller firms.

## ECOMMERCE SUPPORT

The extent of electronic (online) support provided by organisations, particularly suppliers to their customers, often depends upon the level of maturity that organisation has with electronic commerce. Turban *et al.* (2000) suggests that the very lowest level of online support would be a basic Web site that provides current and potential customers with information about the nature of the products they sell (manufacture, wholesale or distribute). This phase is the information gathering phase, and often involves the setting up of an electronic catalogue of the supplier's products. Links may be provided to other virtual sites associated with the company, which may include technical advice about the product. This level of service is similar to business to consumer type eCommerce where the individual *shopper* seeks basic information about a range of products they may wish to purchase. The difference between the two types of customers, is that in the business to business case, the customer is usually another business; in the case of business to consumer, the customer is usually and individual person. This stage is often termed *electronic marketing*.

At the other extreme, customers may be able to make their purchases online by filling out order templates which connect to back-end databases. More often than not, organisations are making use of EDI either formally using private value added networks, or increasingly, the Internet. Much larger organisations (both large suppliers and large customers) will offer access to their information systems via Extranets—a dedicated network between associated organisations via a private network arrangement or public Internet.

In between these extremes, eCommerce support implies the ability for business partners to check on product delivery status, to act as electronic intermediaries, or to simply provide a mechanism for facilitating contact e.g. using eMail.

Apart from customers sharing information with suppliers using POS and other data (e.g. direct forecasts from customers), suppliers are progressively using Web sites to provide customers with access to display catalogues, prices etc. The extent to which suppliers provide this facility is an indication of their support level for their customers.

Suppliers were asked if they had a Web site—39.4 per cent indicated they did (c.f. Kurt Salmon survey in the USA was 65 per cent). Of those companies that didn't have a Web site, 39 per cent indicated their intention to have one within three years—21 per cent had no plans at all. Of those with a Web site on the Internet, Table 4 indicates what their Web site is used for.

**Table 5: Web site usage**

Web site used for:	Australian Survey 1999 (per cent)	Kurt Salmon 1998 (per cent)
Providing general company information	27.0	
Displaying catalogues & product information	25.2	59.0
Taking orders from customers	6.1	18.0
Customer surveys	1.2	
Providing general information to other suppliers	31.3	
Providing specific information to individual suppliers	2.5	
Purchasing	0.6	
Other	6.1	23.0

The finding that 60 per cent of respondent firms did not have a Web site and that 21 per cent of those firms had no intention of creating one clearly illustrates the difference in eCommerce technology use between the USA and Australia at present and probably in the longer term. This means that caution is needed when comparing the two markets because there are likely to be key technological as well as size and market differences between the two. In addition this reinforces the finding of Harris et al. (1999) that there is a lack of commitment to adopting the underlying technologies and essential business activities necessary for QR and ECR in Australia.

## CONCLUSIONS

Today the massive investment in IT is leading organizations to make changes in the way they think about and run their businesses. Williams (1999) succinctly summarizes the situation when he says we face 'change in what we do, how we do it, with whom we do it, and the tools we use to get it done'. There is no doubt that industry is facing new rules of business together with one of the toughest environments in which it has ever operated. When this environment is coupled with a consumer demand for more variety and immediate replenishment, supply chains have to cope with huge numbers of stock-keeping units.

With the early recognition of the importance of supply-chain management, industry leaders have used several different models to create uniform supply-chain management techniques. For instance, in the clothing, textile and footwear industry, QR has been used as a consumer driven business strategy of cooperative planning by supply chain partners (McMichael *et al.* 1997). And, in the grocery industry, efficient consumer response (ECR) has been concerned with transforming the grocery supply chain from a "push system" to a "pull system" (Harris *et al.*, 1999).

The results presented in this paper, suggest that there is clear evidence to indicate the growing need for Australian suppliers to become more intimate, with increased cooperation in planning and data sharing with their customers (the large retailers). Compared with their American counterparts, Australian suppliers are not receiving the quantity and type of data they require to assist with forecasting and planning, and so assisting them to become more internationally competitive. While formal metrics were being used, they principally concentrate on techniques to measure traditional sales goals. Very few organisations were actually using other techniques to measure performance, e.g. lead time goals, inventory turns, or goals related directly to electronic sales of merchandise.

While the majority of supplier firms were involved in automatic stock replenishment schemes, it is of more concern that over a quarter of suppliers indicated that they had no intention of participating in such a scheme. This is not particularly good news for their large customers.

The level of eCommerce support provided by suppliers is considerably less (less than half) than their American counterparts. This suggests that Australian suppliers have a long way to go in providing electronic support to their key business to business customers.

In this new business environment driven by consumer demand, entire supply chains are under more pressure to be reliable, responsive and to fulfill orders even more quickly. For all organisations, the question today is how to build the business systems to deliver value tomorrow. If they are to deliver the sorts of economic benefits suggested by the FAIR Project Consortium and NOIE, then considerable efforts will be required by both the partners on either side of the virtual fence.

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# Supply Chain Management and B2B E-commerce for a Non-profit Organisation

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## ABSTRACT

*This paper discusses the supply chain management and the impact of implementing E-commerce applications on enterprises. It examines the role of Porters work on supply chain and competitive forces. It discusses the role of value chain integration management in increasing customers' perceived value. It also explores the likely impacts of Internet technologies faced by the enterprise. In this paper, the traditional supply chain model and integrated value chain model are used to investigate the information flows of business processes of an international non-profit organisation #A.*

*Initially the paper describes how the company's integrated value chain analysis was used to identify organisation # A current business processes. It then further focused on competitiveness and the role of Internet technologies in investigating information flows of business processes conducted in the new digital economy.*

*Keywords: Supply Chain Management, Porters Value Chain Analysis, Electronic commerce, Web-based legacy EDI.*

## INTRODUCTION

The main aim of this paper is to examine the role of Porters work on supply chain and competitive forces. It discusses the role of value chain integration in increasing customers' perceived value to the enterprise concerned. It also examines the impacts of Internet technologies in effecting competitive advantage to organisation. In this paper, the Porters traditional supply chain model and the integrated value chain model are used to investigate the information flows of business processes.

In order to succeed in the digital economy, an enterprise must understand what its core competences are and how it can maintain its competitive advantage. This can be achieved by forming alliances with partners in order to provide customers with services that knit together seamlessly. As a result, value chain integration is seen as a tool for enterprises to achieve core competences. In a report by Cambridge Technology Partners, 'a value chain integration is the process in which multiple enterprises within a shared market cooperatively plan, implement, and manage (electronically and physically) the flow of goods, services, and information from point of origin to point of consumption' (Cambridge Technology Partners Report, 1998).



The first section of this paper introduces the literature currently available, on the role of integrated value chains that address the technology challenges faced in the digital economy. Following this, the second section provides the discussion of case scenario. The third section discusses the research methods used to examine the value chain integration analyses adapted from Porter (1985). The fourth section discusses the preliminary findings as to the role of factors that drive the supply chains and the impact of Internet technologies in effecting competitive advantage to organisation.

## RESEARCH OBJECTIVE

This paper investigates business strategies for an international non-profit organisation #A. The paper is based on an exploratory study to apply Porters model to see how the company's integrated value chain analysis was used to identify current business processes. The paper also investigates the role of Internet applications in determining the factors that affect the business-to-business e-commerce. It identifies shifts in the competitive environment that organisation # A needs to address. Specifically, these factors were identified as: -

the implementation and utilisation of Internet technologies in effecting competitive advantages to organisation #A; and  
the impact of legacy web-based EDI on organisation # A's business-to-business e-commerce supply chain.

The paper concludes with recommendations for the future strategy of organisation # A business processes. It is anticipated the study will provide information and suggestions for organisation intending implementing traditional supply chain management and value chain integration model in creating competitive advantage for all stakeholders involved.

## LITERATURE REVIEW

### Porters Value chain Analysis Model

Micheal E Porter (1986) states that value chain analysis model can be viewed to provide a method of looking at the business with the main objective being to identify ways in which competitive advantages can be achieved. For example it can be applied to business where the top four sections (a) Firm Infrastructure, (b) HRM, (c) Technology Development, (d) Procurement, in which these are items that add support value of a product as figure 1 show. He mentions that the four main value adding activities such as (a) Inbound Logistics, (b) Operations, (c) Outbound Logistics, (d) Marketing & Sales, (e) Service, are classed as the primary value adding variables (Micheal E Porter, 1986). He uses the supply chain analysis model to examine all activities, looking at whether they are firstly still needed, and then to examine ways of firstly improving efficiency and trying to achieve cost reductions to increase the profit margins for the business.

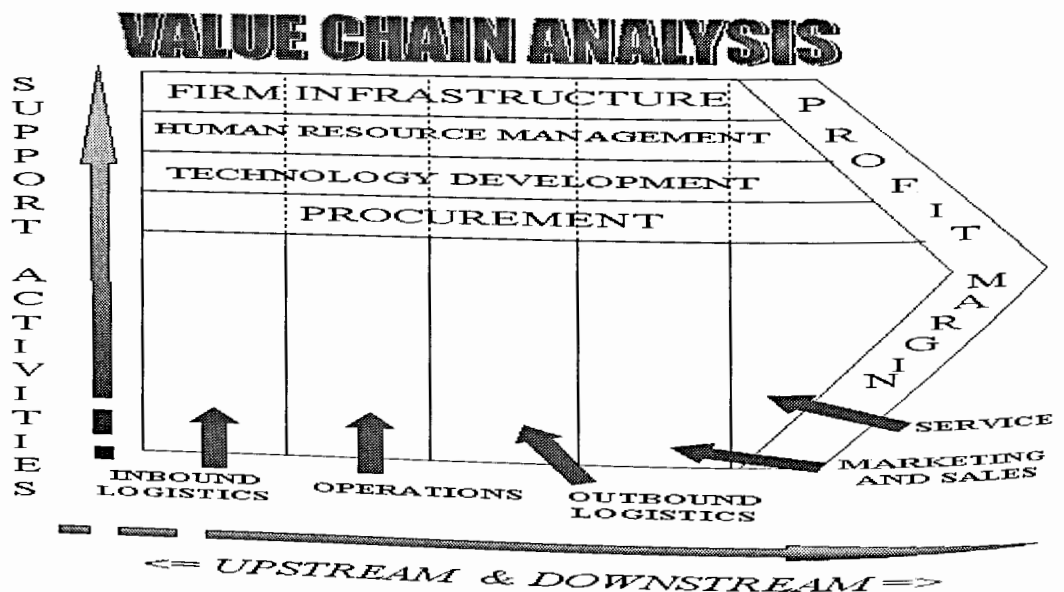


Figure 1: Porters Value Chain Model  
(Adapted from Micheal E Porter, 1986)

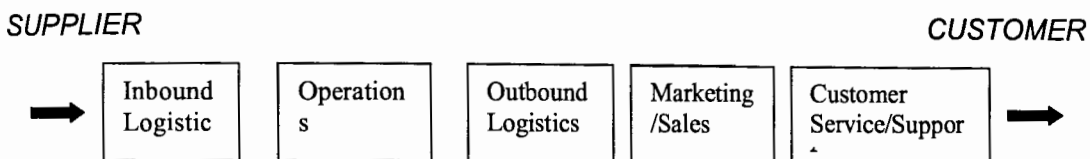
## VALUE CHAIN INTEGRATION

Another authoritative authors Papazoglou, M.P. & Yang, J (2000) state that a value chain integration is when 'an enterprise's business systems can no longer be confined to internal processes, programs and data repositories, rather they must interoperate with other such systems that support links in the supply chain'. Examples of such arrangements include when an organisation's value chain is transformed into an integrated value systems that may be seen as an 'extended enterprise' creating and enhancing customer-perceived value by means of cross enterprise collaboration (Dobbs, J. H. reference in Papazoglou, M.P. & Yang, J, 2000). For example, the use of information systems in electronic data interchange (EDI) among members of a supply chain (Dearing, 1990) and Internet services to link organisations (Kalakotla and Whinston, 1996).

In order to improve e-commerce transactions, the integrated value chain systems, which were created to support the overall business goal, also support the integrated view of all business elements that cut across departmental boundaries (Papazoglou & Yang 2000). They furthermore indicate that this can be achieved through the utilisation of distributed workflow technology that allows business processes to be shared and passed across the value chain so as to create networks of highly efficient virtual organisations which would be impossible to achieve through the conventional business paradigm. The distributed workflow technology is made up of integrated business functions, application program interfaces, data warehousing and the legacy system (Papazoglou & Yang 2000).

The technology challenges in digital economy and Integrated Value Chain

In this section, I shall turn to take a quick back-to-front tour through the value chain, looking briefly at the technological challenges the new digital economy poses within each link. For example, Figure 2 below depicts a generic value chain



According to a report by Cambridge Technology Partners (1998), in the digital economy, an enterprise must have the ability to exchange data with suppliers quickly and easily, regardless of format. The report also states that data formats can be based on standards, such as extensible mark-up language (XML) or electronic data interchange (EDI), whereby inbound logistics systems must recognise and understand data originating outside the enterprise, and also replicate and transform it for use in internal and external downstream processes. Having discussed the inbound logistics, the centre of the value chain, which forms the operational activities, will be examined. In this section the added value occurs as they serve as the "back office" in which the PCs are assembled. In the digital economy, all-operational activities can share data at maximum network speed among internal and external partners, thereby executing the value-adding processes (Cambridge Technology Partners' Report, 1998).

Finally, on the right side of the figure, outbound logistics, sales and marketing, and customers' service and support are the customer-facing links of the integrated value chain. The report also indicates that in the digital economy, customers are required to have an authorised read-and-update access to enterprise data that will supercede obstacles presented by an operational, internal application silo. In return, the companies can interact with customers through a variety of delivery channels. Consequently, this provides companies with the chance to consolidate, aggregate, and deliver data over the Web and any other outbound channels intuitively and immediately (Cambridge Technology Partners' Report, 1998).

## DISCUSSION OF CASE SCENARIO

In order to investigate the elements influencing the integrated value chain analysis and the critical impact of Internet technologies on creating competitive advantage, a study of a non-profit organisation #A has been undertaken.

Organisation #A is a worldwide movement of people who campaign for human rights. It is independent of any government, political ideology, economic interest or religion and mobilises volunteer activists in more than 140 countries and territories in every part of the world. To research the question raised above, I have held preliminary discussions with organisation #A's manager and balance these discussions with the supply chain management literature.

## RESEARCH METHODOLOGY

The research methodology for this study was based on an exploratory case study approach. Key players were identified from Organisation #A's West Australian branch and these individuals (the regional co-ordinator, administration officer and field officer) were interviewed. The interviews were semi-structured and later transcribed.

In addition, informal conversations and documentary evidence was used in order to obtain rich process descriptions of the project. A series of open-ended questions were asked that covered the key areas of:

organisation #A's strategic plan and how their strategy is translated into critical success factors; the impact of legacy web-based EDI on organisation #A's business-to-business e-commerce supply chain; the factors that drove organisation #A integrated value chains analyses and how Internet technologies may effect competitive environment for organisation #A; and perception of satisfaction with a successful e-commerce implementation.

The interpretation of the findings uses a dialectical hermeneutic approach. Hermeneutic is primarily concerned with the meaning of a text or text analogue. Moreover, the role and understanding of the interviewees are interpreted historically, and in terms of social and political structures and includes the contribution of the researcher in the analysis process.

## PRELIMINARY FINDINGS

In this study, Porter's (1985), supply chains analysis will be used as the bases for analysing the case study. The study will also focus on how Internet technologies to effect competitive environment for organisation #A.

## SUPPLY CHAIN ANALYSIS

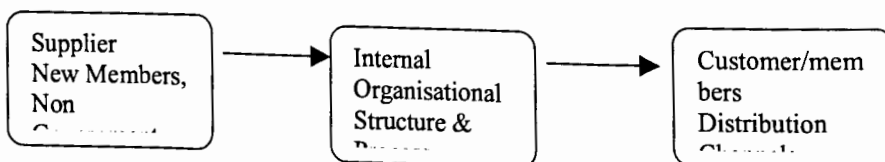
In this section, the strategic insight of organisation #A's business-to-business supply chain is explored. The findings, as to how the legacy web-based EDI system by allowing large volumes of information to flow across organisational boundaries, may transform the relationship between trading partners by bringing them much closer together with its own departments and groups will also be discussed.

The first part of this section is devoted to exploring the following factors: (1) the nature of markets and distribution channels, (2) the organisational structure and process; and (3) the buyer power influence and the implementation of its legacy web-based EDI integrating with its suppliers, members and customers.

In organisation #A's case, staff are always exchanging information about their activities with their suppliers, members and customers through business meetings, the exchange of documents, by telephone, telex and facsimiles. This means that legacy 'EDI may facilitate data warehousing as it is seen to allow large volumes of information to flow across organisational boundaries in a single moment. Legacy EDI also has the potential to transform the relationship between trading partners by bringing them much closer together' (Holland, C. P, Lockett, A. G, and Blackman I.D, 1992).

In an article by Holland, C. P, Lockett, A. G, and Blackman I.D, (1992), the authors suggest that 'the general organisation can cover the whole of the supply chain from inventory to customers and for each industry sector the number of stages may vary'.

For example, Figure 3 below depicts the supply chain for organisation #A.



Legacy web-based EDI may be used in many parts of the chain. In this paper, in order to produce a general conceptual solution for organisation # A, the number of stages has been aggregated to three main ones; supplier, internal and customer/members.

These stages allow me to develop a generic scheme that the management team of organisation #A can apply regardless of their position in the chain.

### **Supplier-related Channel**

According to Holland, C. P, Lockett, A. G, and Blackman I.D, (1992), the authors states, 'The strategic EDI model contains several factors such as supplier-related stage, internal operations and customer-related channels, which are important for planning EDI, links with suppliers. In the past, only companies with a dominant market share were able to impose trading terms on suppliers that included EDI arrangements'. However, the trend has changed. This means that now legacy web-based EDI is seen to be becoming more easily and efficiently integrated into Electronic Commerce. In organisation #A's case, using legacy web-based EDI to do business in the long run would enable them to relinquish its control over its suppliers.

## **Internal Operations Channel**

According to Holland, C. P, Lockett, A. G, and Blackman I.D, (1992), the authors states, 'the internal operations were concerned about the implication of EDI with suppliers and customers on internal operations, and how these can be exploited for the benefit of the organization'.

In organisation # A's case, legacy web-based EDI has created a knowledge repository for storing explicit knowledge. It also created a virtual 'information Library' accessible 24 hours a day to organisation #A's staff across all branches within Australia. This means the improved information exchange will result an increase in intangible benefits, cost reductions and quality improvements.

## **Organisational Structure and Process Channel**

According to Holland, C. P, Lockett, A. G, and Blackman I.D, (1992), 'EDI may link customers with suppliers thus affecting the nature of business relationships. Individual roles and tasks associated with managing customer and supplier relationships therefore change. In picture, staff and cost reductions have been achieved throughout the whole organisation. This concept is not new and could simply be viewed as an extension of the value chain'.

In organisation #A's case, the uses of legacy web-based EDI for information sharing between their suppliers and customers, strategic communications between their subsidiary companies, and information application processes, such as order entry etc, is seen as being significant. In addition, legacy web-based EDI has also enable organisation #A to facilitate the ability to invoice electronically, and tie the transactions into accounting and purchasing systems. This in turn improved organisation #A's quality and timeliness of information, so orders can be placed more frequently and in smaller quantities.

## **Customer-Related /Distribution channels**

In organisation #A's case, the length of the supply chain, from its supplier to its end customers is measured by the number of ownership stages. If there are a high number of ownership stages, it is more likely that it involved a traditional chain of market hierarchies (ie producer, wholesaler, retailer and consumer). However, a potential alternative chains for organisation #A to utilise would bypass the wholesaler, resulting in a lower purchase price for its customers. In reality, organisation #A is likely to retain as high a portion of the savings enjoyed by its customers and members as is possible.

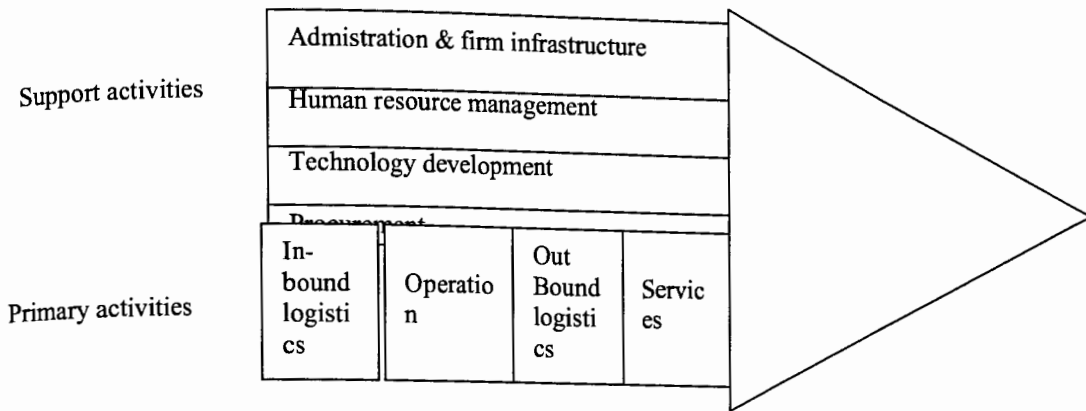
Moreover, in organisation #A's case, the introduction of legacy web-based EDI and its subsequent integration has lead to gains in efficiency and a reduction of manual data entry errors. This can be coupled with redirecting employees from tedious manual tasks to resolving critical business issues in order to improve margins, reduce inventory levels, improve internal processes, and otherwise reduce extraneous costs. Having explored how the implementation of legacy web-based EDI integrating with suppliers, members and customers through Porter's supply chain, the next section will discuss how Internet technologies effect competitive advantages to organisation.

## **THE IMPACT OF INTERNET TECHNOLOGIES EFFECTING COMPETITIVE ADVANTAGE TO ORGANIZATION #A.**

In this section, I shall turn to explore the integrated value chain analyses. Integrated value chain analyses were selected, as they are suitable for investigating information flows of organisational business processes. They also focus on competitiveness and the role of technology.

The integrated value chain analysis may assist organisation # A in the extent to which its staff members are involved in different functions (general management vs. regional action networks staff vs. technical staff).

Figure 4, presents a diagram of the traditional value chain for organisation #A.



**Figure 4: Traditional value chain model**  
(Adapted from Porter, 1985)

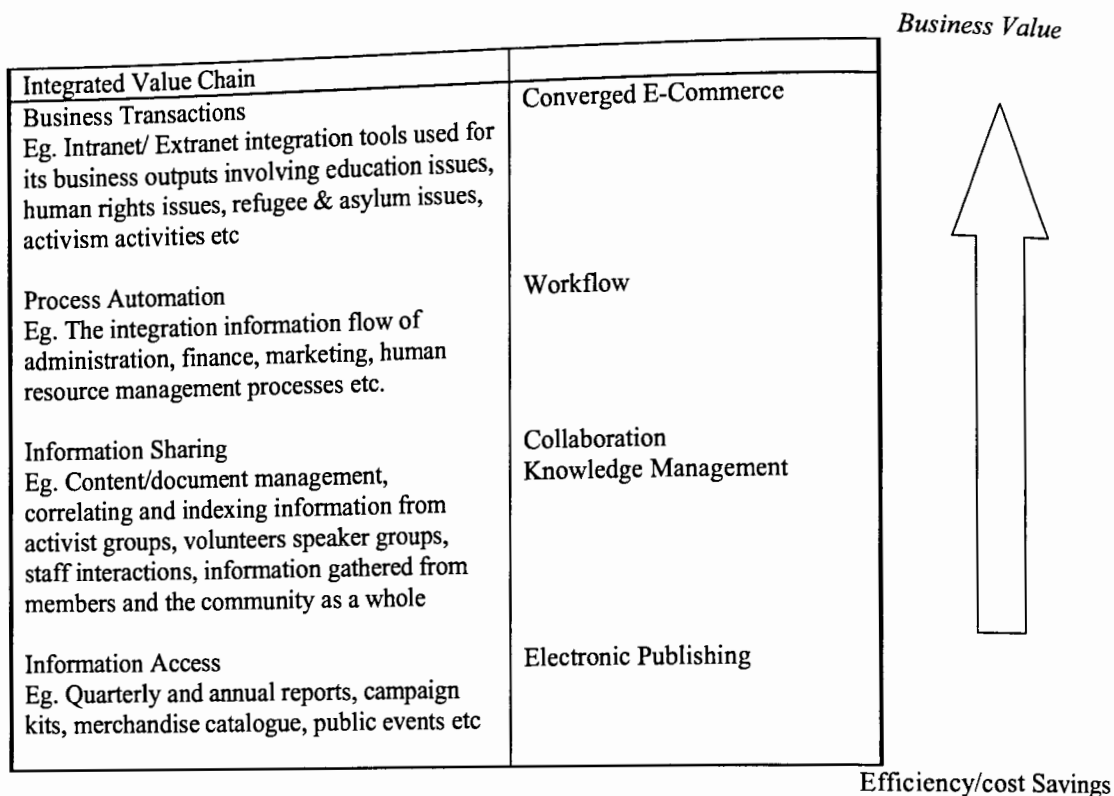
In figure 4, the value activities contribute to the value for organisation #A members, and the margin is the difference between the value added and the cost of producing that value.

Hence, by modelling the activities of organisation #A, it is possible to distinguish between its primary activities, (those that contribute to bringing the service closer to organisation #A's members), from its secondary activities, (those, whose role is to support the primary activities).

Having identified the ability that the traditional value chain model can distinguish the primary and secondary activities through modelling. Consequently, there is a need to propose a new model that can allow organisation #A to investigate the impact of implementing e-commerce applications on its business processes. This means that a model to investigate the information flows of organisation #A's business processes conducted in the new digital economy, (which in this case is the application of web based service application)

With this in mind, by optimising and integrating the traditional Porter's value chain model as figure 4 show, beginning with analysis and design of the business transactions, progressively moving into process automation, and then information sharing and information access. I am able to develop the proposed integrated value chain model as figure 5 show.

In this proposed model, Internet applications are seen to be taking on a much broader and more strategic role in support of business requirements that go well beyond efficiencies and cost saving achieved through electronic publishing.



**Figure 5: the proposed integrated value chain model for organisation #A**

In organisation #A case the greater its ability to extend its Internet applications and move up this stack, the more value is returned, as simpler applications deliver cost savings and efficiencies, while the upper layer applications create value, not just cost savings. For example, publishing quarterly & annual reports, the member's directory, events of activities (an electronic publishing application) can save time, paper, printing and postage costs.

Furthermore, allowing customers to purchase products, and make contributions Online, and integrating the customer service application with the purchase process, will save money. This may also open up a whole new market- let's say, an international market – which was not previously available to the business.

In order to improve the interoperation support for e-commerce, leading Internet applications have evolved from the current simple page-serving environments to rich application platforms providing server-side application runtime engines – and in some cases integrated security, encryption, indexing, messaging, scheduling and database services.

This means that it is desirable for organisation #A to look beyond publishing applications to the business processes and opportunities that need to be addressed. Three such opportunities are outlined below.

Firstly, profitability from commercial activity on the Web includes productivity savings, information management savings, and incremental or new revenue streams (members fees collection).

Productivity savings arise from reduction in order and processing costs, and more efficient information management. Improvements in information management make information easier to find and share as content/document management, correlation and indexing information, dynamic publishing, and custom profiling can facilitate collaboration. The increases in collaboration achieved as a result of more efficient personnel may also lead to productivity gains.

Secondly, savings may also be realised from improved efficiencies in the marketing and human right's campaign functions. The Internet shifts more of these functions to the customers and members. As a result, savings on marketing may result through reduced brochure printing and distribution costs. In addition, savings on expenditure related to human rights campaign functions may also result from making information easily and widely available. As standard efficient information access is made available to members, I speculate that members' satisfaction may actually be increased.

Thirdly, incremental or new revenue streams are available for organisations participating in digital commerce, through, for example, online sales, advertising revenues, or information brokering. Incremental revenues may be achieved for organisation #A by using the Web to expand into new channels of collaboration and knowledge management and the new market segments of electronic commerce.

## **DISCUSSION AND CONCLUSIONS**

The results of this study show that the implementation of legacy web-based EDI for organisation #A has successfully increased the number of electronic connections, simplify interorganisational process and at the same time discover ways to shrink, speed up, and virtualise it's supply chain. The study also address how the Internet technologies have effected competitive environment to organisation #A. It also explore the supply chain management strategies for organisation #A through the followings:

order management, planning, forecasting and replenishment (eg competitive advantage and higher revenues from reduced stock outs, lower cost through reduced inventory and lower costs through reduced returns);

sourcing (eg competitive advantage and increased revenue through faster product introductions and decreased costs and increased revenue from higher quality);

design and product management (eg competitive advantage through faster time to market and lower distribution cost); and

merchandising/category management (eg competitive advantage and increased revenue through effective pricing and promotional strategies).



## LIMITATIONS AND DIRECTIONS FOR FURTHER RESEARCH

The approach used in this paper is geared to provide successful supply chain management strategies to a non-profit organisation. In addition, the result of this study can be easily generalised to other similar organisations – in particular, to Government Non-Profit Organisations, in other states and other countries.

However, the directions for further research will concentrate on the virtual value chains. This means we need to focus on what is likely to happen to organisations strategic directions? Are they going to be disintermediated or are they likely to survive by transforming their businesses into new types of intermediaries operating in a neutral market?

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# An Inter-agent Communication Framework for B2B and B2C Trading in an Active Networked E-marketplace

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## ABSTRACT

*Internet-based e-marketplaces are locations where mobile agents of merchants and customers can perform trading. As a result of the high competitiveness and the growing popularity in B2B and B2C trading in the e-business world today, these transactions have to be executed in a minimal time and with a minimal cost. This paper proposes a new framework of Inter-agent communication in e-commerce transactions by performing them in the network layer instead of in the application layer of the OSI model thus reducing the execution time and cost. The proposed method makes use of the user programmability feature of the active routers.*

*Keywords: B2B and B2C trading, e-commerce, mobile agents, communication protocols*

## INTRODUCTION

Agent technology is becoming increasingly important in the Internet-based electronic markets. Agents are software programs that can act on behalf of a user or an organisation in order to accomplish a task. There are two types of agents known as stationary agents and mobile agents. Stationary agents are executed only in the machine that they started execution and may use remote procedure calls (RPC) to interact with the agents that are not on the same machine. Mobile agents are programs that can autonomously migrate through the network to a different location and perform tasks on behalf of its owner (Chih-Lin et al 2000). A mobile agent has the ability to halt the execution at one place, migrate through the network and resume the execution at its new location. When mobile agents are used for e-commerce transactions, they have to communicate with each other in order to exchange information, negotiate services or delegate tasks. This is known as agent to agent communication or inter-agent communication. In the last few years, some agent frameworks, languages and protocols have been developed, especially for inter-agent communication in a mobile agent environment (Dasgupta et al 1999). While some of these approaches are language-specific, the others are more general in nature.

There is also an emerging concept known as e-marketplaces where the merchant's agents, broker's agents and customer's agents can meet and negotiate the services (Feldman 2000). E-marketplaces introduce new networking challenges as they can be located anywhere in the network. For example, an e-marketplace can be located at a special place such as at a broker's site or at a common location to a group of consumer agents. As far as the performance of mobile agents and their e-commerce transactions are concerned, languages and protocols developed for inter-agent communication at application layer level become questionable. Although these protocols enable us to use an open standard, they will inevitably increase network traffic as well as response time. Furthermore, they will be inefficient especially when mobile agent technology will be widely used for e-commerce transactions.

To address the issues, we propose to explore a method that makes use of the emerging communication technology known as active networks. An agent-to-agent communication protocol operating in the network layer can address the issue of improving efficiency and reducing latency. Such a protocol designed using the same philosophy as the IPsec, mobile IP or IPv6 protocols (Comer 2000) should provide a network level solution for

an open standard. Just as we can communicate between applications like FTP or Telnet by using IP datagrams, we will be able to realise inter-agent communication using a new protocol at network level. This globally defined protocol will also overcome the problem of how heterogeneous agents from different users (using different languages) can communicate with each other. The packets that flow through the network using this protocol will be recognised by the active routers and will be processed to identify the type of the agent. We perceive two locations for the negotiation between the merchants' agents and the customers' agents: In the e-marketplace scenario, the information delivered by the merchants' agents will be stored in the active router and the mobile agents of the customers will visit these routers to find a suitable matching. In the door-to-door selling scenario, mobile agents of the customers will store the information in the active routers located in the home network of the customers and the merchants' agents will visit these routers in order to find a prospective customer. The active router in the latter case may be an edge router of the organisation.

The rest of the paper is organised as follows. In the background section, we provide a brief description of the existing forms of inter-agent communication and in the following section, we present our proposed method. The security issues are dealt with in section 4 and the paper is concluded in the section 5.

## **BACKGROUND**

In this section, we will examine some existing forms of inter-agent communication and discuss the advantages and disadvantages of them. Traditionally, multi-agent systems have used Agent Name Servers (ANS) to enable interaction between agents (ISAG 2001). In the case of Internet-based systems, agents use ANS simply to look up the IP address of another agent and then to use that address to make a socket connection directly to that agent for the purpose of exchanging messages. The problem with this approach is that if the IP address of the latter changes, the former will only find it out when the next attempt to send a message fails. Also, if an agent crashes due to some reason, it is the responsibility of the other agents with whom it was communicating to properly save any interrupted messages and re-transmit them later. Improved approaches include the JATLite Agent Message Router (AMR) (CDR 1998) and the middle agent entity. AMR is a specialised application that receives messages from registered agents, and queues these messages in the file system before routing them to the correct receivers. Middle agents are entities to which other agents advertise their capabilities, and are neither requesters nor providers from the standpoint of the transaction under consideration. Their operations are similar to that of AMR, but include other important functions like acting as facilitators and mediators.

All the forms of inter-agent communications we discussed above involve an Agent Communication Language (ACL) such as KQML, FIPA or ACL (Breugst et al 1998) that provides a tool and framework to handle the interoperability problems of inter-agent communication in the application layer. However, so far, there is no common standard developed on which the agent communications can or should be based. Figure 1 shows an example of the inter-agent communication scenario which occurs in the application layer.

Any inter-agent communication model which involves communication between the two application layers in the OSI model would be less efficient and costly compared to the communication in a lower layer such as in the transport layer or network layer. Besides, as described in the following paragraph, it is the trend in modern network design to facilitate more flexible communication in the network layer using the concept of active networks.

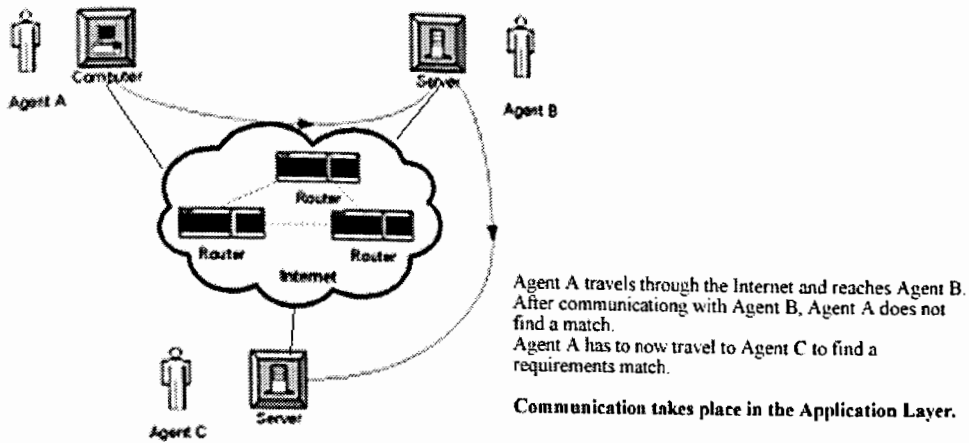


Figure 1: Inter-agent communication in the application layer

Because of the difficulty of integrating new technologies and standards into the shared network infrastructure, poor performance due to redundant operations at several protocol layers, and difficulty of accommodating new services in the existing architectural model, the concept of active networks was conceived in 1994 following the discussions within the Defence Advanced Research Projects Agency (DARPA) research community (Tennenhouse et al 1997). Today's networks transport data from one end of the network to another without modifying them. Processing of packets flowing through the network has been largely limited to routing, providing quality of service (QoS) and congestion control (Legedza et al 1998). In contrast, in an active network, the routers or switches of the network perform customised computations on the messages flowing through them (Tennenhouse et al 1996). For example, a user of an active network could send a program code to each router and arrange for the program to be executed when their packets are processed. An active router can perform all the existing tasks of current routers in the network. Instead of insisting that all the routers perform equivalent computations on every packet, active networks specify that all nodes support equivalent computational models. Active networks raise the level of abstraction at which interoperability is realised, allowing applications to customize message processing to suit their purposes.

With the deployment of active routers in the near future, it can be anticipated that different proprietary transport or network level protocols of organisations will be recognized by active routers belonging to different telecommunication companies. These routers will store information and perform specialised tasks on the user packets passing through them.

## PROPOSED METHOD

In our approach, we propose to exploit this concept of active networking to enhance the inter-agent communication. To this end, we need to design a framework for an inter-agent communication protocol. Active routers will recognise this communication protocol, and read the information of the agent that is contained in certain fields in the packets.

In the following simple example (see Figure 2), we show how agents interact with our communication protocol in an active networking environment. Let us assume that Merchant A is an authorised user of an active router that is connected to the Internet. That is, Merchant A has the permission from the owner of the router to store information and run loaded applications. Merchant A has an agent that has the responsibility to advertise and sell certain products of the company. This agent then sends packets using our protocol to the active router. The active router being pre-loaded with the command application, recognises agent A's packets and stores the agent's information such as its type, products and prices etc. that it has on offer. The active router will then look for packets from all the agents, who could be potential customers. Customers that have user agents of our protocol will be recognised by the active router which, in turn, will help them find or locate the merchants and merchandise if requirements in all the fields such as products and prices are matched. Customer's mobile agent will then send a request of confirmation to its home counterpart and the normal transaction will follow.

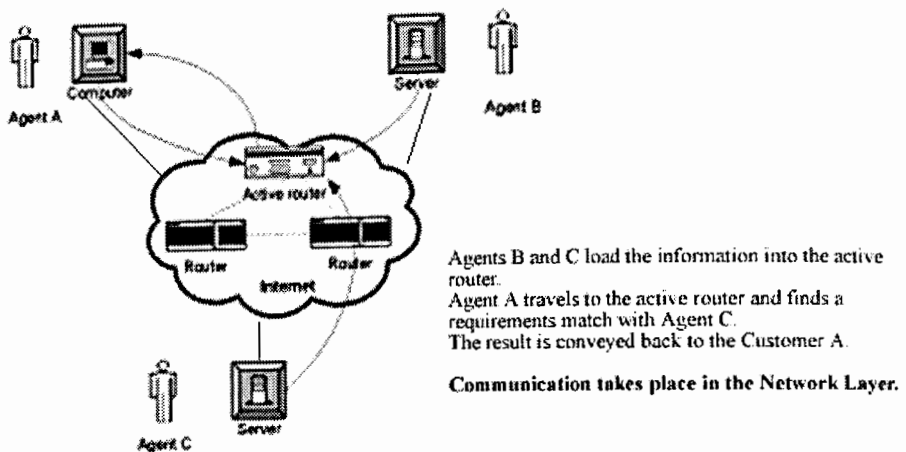


Figure 2: Inter-agent communication in the network layer

In our method, each agent has a set of fields. These fields are arranged in an inverted-tree hierarchy. The top field or the root field corresponds to the agent itself. The second field defines whether the agent represents a service or a product. At the third level, the product or the service is divided into many categories. For example, if it is a product, it can be associated with a broad product category (such as furniture). This will be very similar to the listings in the yellow pages. At the third level, the product is further refined in its category. At the bottom or leaf level we find the fine details of the product such as price (or price range expected), lead time of delivery (or lead time that can be allowed), quantity available (or required) etc. This means that a path from the root to a leaf in the merchant's product tree specifies a particular product that the merchant has to sell and a path from the root to the leaf in the customer's product tree specifies a particular product required by the customer. When the agents generate the packets, they simply create a main IP header and a set of extension headers. The first extension header corresponds to the second level of the product tree, the second extension header to the third level and so on. For the current version of the Internet Protocol that uses IPv4, we recommend to encapsulate each of these IP datagrams in IP (IP-in-IP encapsulation). With the deployment of IPv6, the transmission of these packets will be straightforward as the IPv6 has the provision for extension headers.

Each agent that is registered with an active router knows the IP address of the router and will send its mobile agent to the router. Once these packets arrive at the active router that is pre-loaded with the required code, it will intercept the data stream and store the information contained in the extension headers. Our active router now contains the information of the product and is ready to work as an e-marketplace. If a customer's agent passes through this router, the router intercepts the data stream and looks for the first extension header. If that matches with that of the stored first extension header it will copy the second extension header and will try to match it with the second extension header stored. This process continues until the extension headers at the leaf level are compared. If there is a perfect match, the customer's agent returns to the customer informing the details about the match. The normal transaction can now take place between the merchant and the customer.

The advantage of this method is that, by simply examining the first few extension headers, the router and the customer's agent can decide whether it is useful to continue the comparison or not. Apart from that, the router does not have to intercept and read the entire data stream of the agent. This reduces the processing time of the router and, in turn, the cost of using the active router. Moreover, the packets of the agent will not travel end-to-

end across the whole network to communicate with the other agent. All these reasons contribute to the reduction of network traffic dramatically as well as to decrease the response time. This simple and efficient solution of inter-agent communication is therefore a valuable asset considering the growing popularity of agent technology, e-commerce and active networks.

Note that the agents that do not use our communication protocol can operate alongside with the agents that use our protocol. For example, in the event that the active router does not recognise a customer's agent, the agent can migrate to the merchant's site and perform the transaction there at the application level. Our model pursues the idea of developing customer agents that have only the knowledge of the location of their active router, and it is the duty of the merchant's agent, and in turn, that of the active router to identify the potential customer by intercepting packet flows and investigating certain fields in the header of the packets. While agents can utilise our idea of network layer communication, agent developers will only need to add on some fields according to our design format without changing its entire implementation. The active routers communicate with each other and share the information of the merchants' agents. Also, they will forward the customer's agents to the next active router.

One problem that we anticipate is the memory requirement of the active routers. As the popularity of the e-marketplaces grows, the number of agents that wish to register with an active router to store the information of their products or services may rise exponentially. We propose to handle this situation by introducing timestamps. Each product or service must be associated with a timestamp and if the time limit is exceeded the product is considered to be obsolete and will be removed from the memory.

### SECURITY ISSUES

The most frequently mentioned problem with active networking and mobile agent technology is the security of the information that flows in the network. Active networks expose the now closed environments in the routers to the users by allowing user programmability. As such, the network level security will become more vulnerable. However, in our method, well-known security measures designed for network level security should be adequate as only the matching of a particular product and not a real business transaction is involved. We can achieve this by encapsulating the IP datagrams in IPsec, a security protocol designed for the information protection in the network layer (Comer 2000). We believe that this should provide adequate security to prevent interception and masquerading by unauthorised persons.

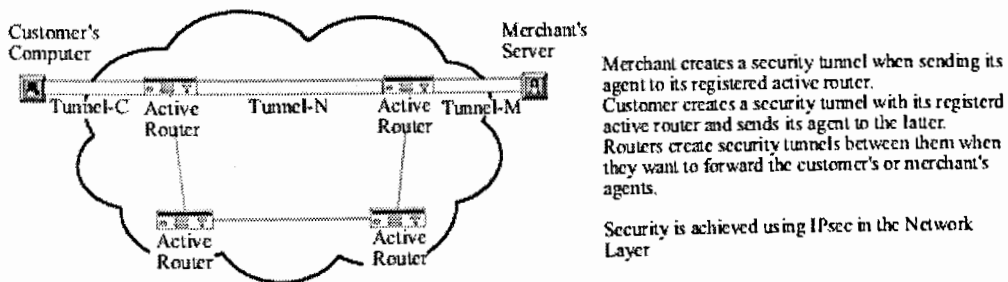


Fig 3: Security at network level is achieved by means of IP-tunnelling

It is also possible to create an IP tunnel (Comer 2000) between the customer's network and the active routers and the active router and the merchant's network (see Fig 3). Providing security for mobile agents is currently an active area of research (Xudong et al. 2000). This is a much harder problem than providing security at the network and lower layers as is in our case because it involves providing security at all levels. The research community engaged in active networks has provided some solutions to improve security in active routers (Wetherall et al. 1998) but further investigation and experimenting are necessary before commercial active networks are deployed.

## CONCLUSION

With the increased demand for e-commerce in the current Internet-centred marketplace, capacity for data transmission will be adversely affected due to the nature and the increased frequency of transactions. Present e-commerce transaction protocols operate in the application layer of the OSI reference model. In B2B and B2C transactions the mobile agents have to travel all the way through the internet from the source to the destination. This involves processing in the application layer at the destination. Besides, even after travelling to the destination and after processing, the mobile agent may still not find a suitable match to execute a successful transaction. In that event the mobile agent has to re-traverse the internet until it meets a matching merchant's agent. This contributes to increased internet traffic, congestion, response and decision times and eventually the cost involved.

We have introduced a new framework for inter-agent communication that takes place in the network layer. This method makes use of the functionality of active routers and creates a virtual e-market place in them. In contrast to the inter-agent communication methods that are executed in the application layer, our method reduces network traffic, decision and response times, network congestion and the cost. By assigning the properties of the product or service to a tree hierarchy and associating each level of this hierarchy to an extension header in IP datagrams, we have developed an elegant and simple method to execute B2B and B2C transactions. We believe that this method would be very attractive for inter-agent communication.

Currently, we are developing this protocol and implementing it on Linux. We plan to report the results and outcomes in a future paper.

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# E-Commerce: A Victorian Case Study

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## ABSTRACT

*The paper relates to an investigation of the uptake of electronic commerce by businesses in Geelong, Victoria, Australia between 1999 and 2000. The projects focused upon how small and medium sized organisations view and use E-commerce and also how Geelong and Australian organisations responded to the use of e-mail. The results of these investigations are reported within this paper.*

*Keywords: E-commerce, SMES, e-mail, adoption of information technology.*

## INTRODUCTION

In the developed world the influence of information systems can be seen in most operational areas of business. A significant result of these advances is that organisations have become increasingly dependent upon the availability of systems and reliant upon the data that they hold. In recent years the Internet has grown from a solely military/academic network to one that can be used by businesses and individuals. In the years since the first World Wide Web applications were developed, there has been an explosion in the global use of the Internet. Clarke (Clarke, 1993) has proposed the concept of *electronic commerce* as a means of drawing together a wide range of business support services.

Australia has been quick to realise the opportunities associated with online developments, or the new 'information economy'. Close to half of the Australia's population are accessing the Internet, Australia has the fourth highest usage in the world. All medium-sized businesses and over 80 per cent of small businesses in Australia use personal computers. Over 35 per cent of all businesses have an online presence, a comparative business advantage that translates into Australia being consistently rated in the top ten nations globally for its E-Commerce environment (NOIE, 2000).

## PROFILE OF GEELONG

Geelong is located in the state of Victoria, Australia's smallest mainland state. Geelong is Victoria's second largest city after Melbourne. It covers 250,000 square kilometres and, as at 1996, has a population of 203,000. Major industries include manufacturing and processing, a wide range of primary industries, wholesale and retail trade, service industries and tourism (Geelong Council, 2001). The Geelong region is expected to experience large productivity gains from the increased use of E-Commerce. These productivity gains will result in a steep increase in Gross Regional Product up until 2006, when it peaks at 3.8 per cent. This will be greater than the Australian national average. The retail trade industry is expected to decline the most (3.9 per cent). The fall in this sector is dominated by the disintermediation effect, that is, a reduction in margins associated with greater use of E-Commerce (NOIE, 2000). The aim of research was to determine what the actual situation was within Geelong. The research covers a two-year period and focussed upon attitudes towards E-commerce and the use of E-Commerce services.

## SURVEY OF GEELONG BUSINESS

The aim of the first project was to determine the attitudes that businesses in Geelong had towards E-Commerce and what they perceived to be the barriers or advantages of E-commerce. The candidate organisations selected for this survey were randomly chosen from the Geelong Chamber of Commerce web site (<http://www.geelongchamber.com.au>). One hundred businesses were selected and received a questionnaire which was designed to investigate their actual use of and attitudes towards information technology and their perceptions about the use of technology in their industry. All organisations were categorised as SME's that is an organisation with less than 150 employees. A total of 47 responses were received of which 36 were categorised as using information technology, in particular on-line services, and the remaining 11 were not using information technology, this being 77% and 23% of returns respectively (Warren and Hutchinson 1999). These organisations will be referred to here as IT-related and non-IT related organisations respectively. The survey was anonymous; hence there was no follow-up on the 53 non-respondents to the questionnaire, as we had no way of identifying who they were. Table 1 shows the diversity of businesses that took part in this pilot study. The most common business was manufacturing with retail trade a close second. The 'Other' category included a miscellany of businesses ranging from Advertising and Tourism, a Disability Contractor, an Electric Motor Repairer to Winegrowers.

Business type	Frequency	%
Manufacturing	11	23.4
Retail Trade	7	14.9
Health and Community Services	3	6.38
Property and Business Services	3	6.38
Construction	2	4.26
Wholesale Trade	2	4.26
Agriculture	1	2.13
Communication Services	1	2.13
Cultural and Recreational Services	1	2.13
Finance and Insurance	1	2.13
Government Administration and Defence	1	2.13
Mining	1	2.13
Personal and Other Services	1	2.13
Other	12	25.52
TOTAL	47	100

Table 1: Types of businesses surveyed

Table 2 shows the distribution of the number of staff in the organisations surveyed. The data is presented for IT and non-IT categories as well as for all businesses. The relative frequency is shown in brackets. Over 25% of businesses surveyed have staff numbers of between 2 and 20. Further, there were no non-IT businesses that were “one-man bands” or were in the largest category (100+). Both non-IT and IT related businesses are more likely to have 20 or less staff.

Staff Nos.	Non-IT	IT	Total
1	0 (0%)	2 (5.6%)	2 (4.3%)
2-5	4 (36.4%)	9 (25%)	13 (27.7%)
6-20	2 (18.2%)	10 (27.8%)	12 (25.5%)
21-50	3 (27.2%)	6 (16.7%)	9 (19.1%)
51-99	2 (18.2%)	3 (8.3%)	5 (10.6%)
100+	0 (0%)	6 (16.6%)	6 (12.8%)
Total Businesses	11 (100%)	36 (100%)	47 (100%)

**Table 2: Distribution of businesses by number of employees**

Table 3 shows the number of years the surveyed organisations have been in business, again by non-IT, IT and Total. Over half the non-IT businesses have been operating for more than 10 years. Surprisingly, even more (60%) of the IT-related industries had been in business for a similar time. All of the non-IT organisations appeared to be well established, having been in business for at least 4 years.

No. of years	Non-IT	IT	Total
< 1	0 (0%)	3 (8.3%)	3 (6.4%)
1-3	0 (0%)	5 (13.9%)	5 (10.6%)
4 – 5	3 (27.2%)	4 (11.1%)	7 (14.9%)
6 – 10	2 (18.2%)	2 (5.6%)	4 (8.5%)
11-15	3 (27.2%)	8 (22.2%)	11 (23.4%)
16 +	3 (27.2%)	14 (38.9%)	17 (36.2%)
Total	11 (100%)	36 (100%)	47 (100%)

**Table 3: No. of years of operation**

Of the 47 organisations responding, 36 used the Internet for business purposes. But only 55.5% (20) of these have a policy in place concerning the use of the Internet for business purposes. The remaining 44.5% (16) have no such policy. Businesses were asked to identify the main Internet services they used. 'Electronic mail' was the dominant service with 'Promotional Web sites' and 'News and Reference' both being the second most common activity. The results are summarised in table 4.

Internet Use	No. of Orgs.	%
E-mail	32	23
News & Reference	22	16
Promotion/Own Web site	22	16
Vendor/product Information	17	12
Research	15	11
Software Downloads	13	9
Shopping /Financial Transactions	6	4
Education	4	3
Chat	1	1
Discussion Groups	1	1
Entertainment	1	1
Experimentation	1	1
Hobbies	1	1

**Table 4: Business use of the Internet**

Organisations were queried about their use of the Internet for organisational web sites. Of the 36 IT-related businesses, two-thirds (24) responded that they had their own web site. Of these, over half (14) had employed staff specifically to build the site, whereas the remaining 10 had used existing staff. One respondent further indicated dissatisfaction with the need to employ staff. The most common service offered via their web sites was the most basic of 'providing information', but this is equalled by 'promotional services'. The full range of services, together with their relative frequencies, is shown in table 5.

Type of service	Relative frequency
Providing information	32
Promotional service	32
Providing links to contact staff via email	19
On-line ordering or other business transactions	8
Direct input or access to databases	4
Other services	4

**Table 5: Service provision on current Web sites**

## ATTITUDES TO E-COMMERCE

The 46 organisations were asked if they have any concerns with using the Internet. The responses indicated that there was not a substantial difference between the non-IT related and IT-related businesses. Approximately half of the organisations indicated they did have concerns. Table 7 shows the frequency of responses to the question relating to their major concerns with using the Internet. The most frequently mentioned concern is 'Security of Financial Transactions' with 'Privacy' coming a close second. However, it is interesting to note that among non-IT related organisations, 'Privacy' is of greater concern. Only IT-related organisations seemed to be aware of, or were concerned with, issues relating to the proliferation of junk mail.

Concern	Frequency of Mention		
	Non-It	IT	Total
Security of Financial Transactions	2 (18%)	12 (33%)	14 (30%)
Privacy	4 (36%)	8 (22%)	12 (25.5%)
Junk Mail	0 (0%)	8 (22%)	8 (17%)
Cost of Internet Access	1 (9%)	4 (11%)	5 (10.5%)
Response Times	0 (0%)	4 (11%)	4 (8.5%)
Don't know enough to specify	2 (18%)	0 (0%)	2 (4.3%)
Initial Setup Cost	1 (9%)	0 (0%)	1 (2.1%)
Sceptical	1 (9%)	0 (0%)	1 (2.1%)
Cost of Upgrading	0 (0%)	0 (0%)	0 (0%)
Total	11 (100%)	36 (100%)	47 (100%)

**Table 6: Major concerns with using the Internet**

Despite the high priority given to security, the same data presented as a relative frequency paints a slightly different picture. The relative frequencies are included in brackets in table 6. A surprisingly high percentage of IT-related business (22%) were concerned with the proliferation of junk mail. This was presented as being equally as important as 'Privacy' (Warren et al, 1999).

## DISCUSSION OF QUESTIONNAIRE RESULTS

Despite the survey sample being relatively small (47 organisations), the mix of organisations is representative of industry present in the Geelong region, including professional services, manufacturing, retail and wholesale industries. All organisations were categorised as small to medium sized enterprises (SME's) as no organisation had over 150 employees. The survey highlighted some interesting trends, which are discussed below. A relatively high proportion of the organisations surveyed in Geelong are using online services. Of those who are not, about half are intending to do so in the near future. This is an encouraging trend. But of particular concern is the large number of Internet users who do not have an Internet usage policy in place. It is possible that because of the type of transactions many of these organisations are carrying out, they are not aware of the impact that such lack of principles and procedures could have on their organisation. It would seem appropriate to provide SME's with an education service to supply information relating to 'safe' online practices to ensure the integrity and security of their data and transactions. As was highlighted in KPMG (1999), the approach to the adoption to E-Commerce influenced the success of the venture. It would seem that appropriate education would be beneficial to organisations to ensure that they adopted the 'right' approach.

## **A STUDY OF E-MAIL USE WITHIN GEELONG ORGANISATIONS**

The second study related to the way in which Geelong organisations and national Australian organizations use and respond to E-mails.

With millions of e-mails being sent around the world every hour, there is no surprise that businesses are also taking part. In the US alone it is estimated that "300 million e-mails are sent per day" (Brightware, 2000). Although part of that figure will be personal e-mail communication, business e-mail communication will constitute a large percentage. On most large organisational web sites, visitors will find either a contact e-mail address or an online form for submissions. Often you are invited to submit any concerns or questions that you may have. It is this offering of an e-mail address that forms the basis for this second investigation. Is offering consumers this contact information functional, i.e. will we get a reply as quickly as we would if we telephoned the organisation directly? Or is this purely a "we must be on the web" type of philosophy, where the contact details are supplied, but the organisation has no infrastructure to support the replies to such e-mails.

As an ever increasing number of business are turning to the Internet to expand and improve their business functioning through customer support, e-mail and information resource access, it is necessary that their presence on the web provides the kind of support that the public needs and expects. For most organisations that are conducting business on the web, they have received huge amounts of e-mail. They receive lots of complaints, questions and thanks from customers. To keep up with this demand computer technology is trying to solve the problem it helped to create by using software that scans the text of an incoming e-mail and responds intelligently without any human intervention (Shaffer, 1999). This is not an attempt to downsize a workforce, but rather a requirement to keep up with consumers. Consider the situation in the US. There are already over 91 million Internet users, with 50% of all families having Internet access in the home contributing to over 60% of the world's total volume of e-mail traffic (Electronic Design, 1999). However, in Australia, this number is significantly lower at only 1.6 million (DIST, 1998).

This new way of doing business requires trust and security to boost the confidence level of consumers to persuade them to partake in the use of E-Commerce (Goh et al, 1999). National studies of email replies in USA (Brightware, 2000) found that only 13% of top US organisations answered an on-line query within three hours. The aim of the study was to repeat the same study but using Geelong and national Australian organisations.

### **STUDY METHODOLOGY AND RESULTS**

The survey email was sent out to a total of 135 organisations in Australia. Of those, 60 organisations were considered to be national, while 75 were Geelong based. The Geelong based organisations tended to be smaller organisations. The e-mail addresses of the organisations surveyed were obtained from business telephone directories, organisations web sites and listings found within print media. The e-mail query was sent out from a private Internet Service Provider e-mail address, during Tuesday 7<sup>th</sup> of March 2000. The emails were sent in several batches between 9am and 10am on the day in question. The differences in time for the e-mails were recorded. The query was simple; it asked the organisation for their physical address. The question was chosen for its applicability to all organisations, i.e. that all organisations have an official mailing address. It was also deemed to be a neutral question, not inflammatory or intrusive in anyway. Of the 135 e-mails sent, there were a total of 88 responses; an overall response rate of 65%. Figure 1 indicates the response rate from national organisations whilst figure 2 indicates the response rates from locally based Geelong organisations.

	No Replies	%		No Replies	%
Replied	43	71%	Replied	45	60%
Did not reply	13	22%	Did not reply	20	27%
Undelivered	4	7%	Undelivered	10	13%

**Figure 1: Response from National Organisations**

**Figure 2: Response from Geelong Organisations**

From the above, we can see that there was a higher response rate from the national organisations. There were also less undelivered e-mails from the national organisations (7% as opposed to 13%) due to the supply of incorrect e-mail addresses. However the “did not reply” category were comparable in size. The possible reasons for these results will be discussed a later.

All email response times were tested for significance at the 5% and 1% levels of probability ( $p=0.05$ , and  $p=0.01$ ). This was undertaken using a 2-Sample T-Test. E-mails that did not provide a response were removed from the significance test and used only to provide descriptive statistics, as were the undeliverable e-mails. However, those organisations that responded asking why we required a mailing address were included. This was then tested for significance at the two levels of probability. Results were found to be significant at the 5% level, but not at the 1% level, as shown by figure 3.

	Sample Number	Mean	St Dev	T obt	P
National	43	431 mins	667 mins	+/-2.4	0.019
Geelong	45	1001 mins	1441 mins		

**Figure 3: Results of Statistical Analysis**

Of the national organisations, 11 replied in less than 1 hour, with 4 minutes being the quickest response time. The results were very similar for the less than 1-hour category in the Geelong organisations, with 10 responding, and the quickest time being 5 minutes. After about 9 hours, the majority of national organisations had replied to the request, but this was not the case for the Geelong organisations. In the “more than 30 hours” category, only 1 national organisation was included, with a response time of 2 days, 6 hours and 46 minutes, but 10 Geelong organisations took more than 30 hours, with the worst response time being 4 days, 8 hours and 46 minutes. The breakdown of the time responses is shown by figure 4.

**Figure 4: Response times by National and Geelong organisations**

	National Organisations	Local Organisations
Less than 1 hour	11	10
Between 1 and 2 hours	7	4
Between 2 and 3 hours	6	4
Between 3 and 9 hours	11	10
Between 9 and 14 hours	2	3
Between 14 and 30 hours	5	4
More than 30 hours	1	10
<b>Total</b>	<b>43</b>	<b>45</b>

Of the organisations that replied the vast majority, supplied friendly accurate information. However, there were a number of organisations that wanted more of an explanation from the enquirer about the motivation for asking for the address. It was these responses that were some of the most interesting. For organisations that rely on the goodwill and loyalty of the public, some were a little impolite. However it must be noted that as the organisation had supplied an e-mail address. It is possible that the organisations did not see the need for anyone to send them anything in the mail, although the reluctance to supply a mailing address is an interesting phenomenon.

The main thrust of this research was to discover to what extent customer service was taken seriously within organisations with an Internet presence. Does the use and response to e-mail reflect the level of customer service of that organisation? Is there a difference between emailing an organization and calling a toll free hotline, and being unable to get a response to a query for almost 4 days? One of the main benefits of e-mail is the convenience of not having to put so much effort in eliciting that response. From the results of this research, it seems as if timely is not a priority. The majority, national organisations had significantly faster response times than the local organisations, but still that almost 20% of these took more than 9 hours to reply to a simple e-mail request.

The local organisations performance was much poorer. It is perhaps fair to look at reasons why these local organisations should fall behind their national counterparts, considering that e-mail is as cheap and as accessible to them as it is to large organisations. Large organisations can afford to invest in staff and technology as part of their E-commerce strategy to handle customer queries. Generally, smaller organisations have less staff whose job it is specifically to deal with e-mail queries. However the counter argument could be that all organisations deal with queries, although they are mainly via the telephone. It would surely take less time and be more time effective for staff to answer e-mails than it would be to answer a call, search the answer and then respond (perhaps sometimes having to call the inquirer back). If nothing else, organisations could be seen to be making an effort and do as Singh (1999) suggests "If you do a simple job of acknowledging to the customer that you have received their e-mail and somebody will get back to them, that is a big step forward. Keeping silent is extremely frustrating for the customers".

## CONCLUSION

The two projects undertaken in relation to E-Commerce in Geelong have shown a number of issues. The first study was successful in showing that E-Commerce applications are used within Geelong and that Geelong organisations have similar concerns as their counterparts in other parts of Victoria. The uptake of E-Commerce in Geelong appears to be occurring faster than in rural districts, but many smaller organisations are still hesitant regarding the potential benefits and perceived problems of the new technologies. SME's in particular require appropriate information to make informed decisions about new technologies. They may not have in house expertise and may not be able to, or wish to, afford consultants to provide expert advice.

The second study showed that organisations based in Geelong were not using e-mail as an effective tool to handle the simplest E-commerce applications - answering customer queries. E-mail was designed for and is, effective, efficient and an extremely quick communication medium, that fits into the multi-tasking work environment of modern organisations. Therefore there seems to be little excuse for the unacceptably slow response times apart from poor customer service. Organisations should remember that e-mail is an easily accessible means for customers to contact organisations, and poor response rates could result in a loss of custom.



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# A Distributed Cognition Approach to Integrate Security Management and Business Processes

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## ABSTRACT

*Virtually unlimited information dissemination in the age of the Internet has enabled novel ways to threaten companies. Relevant activities are taking place outside corporate spheres of influence which means that it may be difficult to become aware of activities happening online. In this paper, we argue that this task exceeds the traditional scope of security management and propose a distributed approach to account for the broad scope of the challenge. In particular, we argue for viewing organizations as distributed cognition systems as this provides a conceptual basis for integrating shared problem awareness and distributed threat recognition with regular business processes.*

*Keywords: Information Dissemination, Security Management, Distributed Cognition, Social Scaffolding.*

## INTRODUCTION

Security in the age of the Internet seems to be a topic for technicians in the first place as most Internet-based attacks target corporate networks and computer systems. Examples for attacks that received a lot of attention are the Microsoft hack (e.g., Bridis and Buckman 2000) and the Denial-of-Service (DoS) attack against their domain name servers (e.g., Yasin 2001). The specific circumstances that allowed for these attacks are less important because, as Bellovin (2001) points out, it is unlikely that there will ever be a 'security end state'. This means that even state-of-the-art computer security will only provide *some* protection against attacks. Accepting that software will be buggy, will have holes, and will be insecure is an important step towards a realistic assessment of computer security and towards a lasting change of attitudes and expectations (Bellovin, 2001). This is especially true in the case of malicious code, such as the Melissa virus, the Love Letter virus or the recent SirCam virus exploiting popular combinations of notoriously insecure software and thoughtless users. Accordingly, it is unlikely that computer security efforts will ever become obsolete.

Apart from attacks on corporate networks and computer systems, Internet activities have brought a variety of other less technical risks. Lichtenstein and Swatman (2000) provide an extensive list of such risks. Examples are inappropriate email, low quality data, accidental disclosure and non-business usage of corporate systems. Looking at e-business security management and policy from a holistic point of view, Lichtenstein and Swatman discuss a variety of issues that are involved, such as legal issues and organizational and administrative issues. An issue of particular concern are human issues as these are typically hard to 'control'. For example, Lichtenstein and Swatman found that employees, for the most part, are aware of the non-business usage of Internet resources, and some are deliberately 'behaving badly'. Moreover, Lichtenstein and Swatman found that some security breaches were not due to 'behaving badly' but were due to ignorance, carelessness, or oversight. Examples were misdirected important emails and sent-out confidential emails.

Batten (2000) takes a broader perspective than Lichtenstein and Swatman (2000) when discussing the need for distributed security and argues that prevention alone is not sufficient. In particular, Batten argues that the basic approach to information warfare security is the same as for general business information security: prevent, detect, respond. Detection involves several components ranging from prior knowledge about potential attackers to appropriate reactions.

In this paper, we are looking at ways to cope with potentially threatening activities that are based on the virtually unrestricted dissemination of information. We proceed as follows. First, we list a few examples of actual information-based threats that were reported in the literature and discuss why they are difficult to address. Then, we outline the need to address the information dissemination challenge and discuss the necessary conceptual tools which are distributed cognition and social scaffolding. Finally, we provide conclusions and an outlook on future research.

## **INFORMATION-LEVEL ONLINE ACTIVITIES**

As described in Lueg (2001c), information-level online activities have specific characteristics:

Information-level activities take place outside (secure) corporate environments.

Information disseminated may influence the environment in which companies operate (e.g., reputation, shares price).

Information-level attacks may unfold on a variety of levels. Moreover, the level on which an attack can be observed (i.e., where information dissemination takes place) is different from the level on which the attack unfolds (e.g., creating a certain image of a company).

Information-level activities may be difficult to recognize as significant domain knowledge may be required to understand the threat potential (e.g., fake sales figures).

These characteristics suggest that information-level activities exceed the scope of traditional corporate security efforts.

### **Examples for information-level online activities**

Incidents reported in the literature indicate that the range of potentially threatening activities is rather broad. A few examples reported in the literature:

Urban legends circulating online. Reports in the literature indicate that companies have been forced to post corrections in order to prevent further damage (e.g., Ulfelder 1997, Brauer 1998).

Hoaxes, i.e., false email messages with the only purpose to spread to as many people as possible, promising gifts from companies if they forward the letter to at least twenty people (Park, 2000).

A web site set up by a company providing the information that products of competitors may be horribly dangerous. It seems that the information is nothing but a myth (Fumento 1999).

A web site imitating the site of a well-respected information agency making fake announcements that lead to an increase of interest in the shares of a particular company mentioned in the announcement. Information about the fake site were distributed in web-based message-boards.

A web site (URL <http://www.mcspotlight.org>) providing information a fast food giant tried to suppress in a famous libel case ('McLibel') and lots of other (potentially biased) information.

Spam sent under the name of another person's domain, or web pages ('joe job'). The effect is that lots of people complain to the Internet service provider (ISP) hosting the domain or the web page advertised in the spam as they mistakenly assume they know the source of the spam.

Search engines manipulated to direct online customers to other web sites than they were looking for. Some years ago, the cyber artist group eToy used this technique to 'capture' about one million surfers. Chai (1999) reports an incident where information describing a popular web site were used to direct customers to a porn site.

Online communities sharing information about internal quality standards set by a particular fast food company and how these quality standards are sometimes ignored in the company's own restaurants (Lueg 2001). The information are circulated in a particular Usenet newsgroup but can be found even by casual Internet users when using regular search engines, such as Google (URL <http://www.google.com>).

We have described these incidents in more detail elsewhere (e.g., Lueg 2001b). It is reasonable to assume that incidents reported in the literature are just the tip of the iceberg. For example, companies may not be aware of threatening information circulated online or they may have chosen to deliberately ignore these information. An example for the latter is an US-based car manufacturer who decided not to go online to combat a certain revenge web site as the company was afraid that anything they would do on their own web site would validate what is described on the revenge web site (Ulfelder 1997).

### Information-level activities and technical limitations

There are claims that 'companies that fail to monitor Internet traffic may be headed for a public relations disaster' (Ulfelder, 1997). Companies, such as eWatch (URL <http://www.ewatch.com>), CyberAlert (URL <http://www.cyberalert.com>), and IntelliSeek (URL <http://www.intelliseek.com>), offer specific tools that allow to search the web and other information sources to find out 'what is "being said about [a] company and its products", and that provides "a way to identify potentially damaging rumours"' (Manktelow, 2001). However, strengths and weaknesses of these tools are largely unknown and information on how to incorporate search results into business processes are hard to find.

Moreover, search technology is subject to a variety of fundamental limitations when it comes to information-level Internet activities. First of all, only a limited number of electronic communication channels are publicly accessible. Among the open channels are Usenet newsgroups, parts of the world wide web and public mailing-lists. Contrary, email is mostly private, many mailing-lists are for closed user groups, and many web servers have password-protected areas. Also, many web servers generate web pages *on the fly* which means that scanning all dynamically generated pages is almost impossible.

Second, even in the case of the publicly accessible web, it is simply impossible to monitor all traffic for resource reasons (bandwidth, storage capacity, processing power). Back in 1998, researchers found that coverage of the web by search engines was severely limited: no single search engine examined indexed more than about one-third of the 'indexable Web' (Lawrence and Giles 1998). The web has expanded enormously since then which means that coverage can be expected to be much worse.

Third, even state-of-the-art search and retrieval technology is only good at searching for *known* terms. When people use special nick names when talking about products or companies it is hard for search technology to find out whether people are talking about particular products or companies. Extremely simple examples observed in online discussions are "Wuergerking" (a German language pun) instead of 'Burgerking' or 'McDoof' (another language pun) instead of 'McDonald's'.

Fourth, it is difficult for automatic search tools to find out what people actually do when they are talking about things. Removing discussions from their particular social contexts ('de-situating' in the sense of Grudin, 2001) may result in wrong interpretations. Lueg (2001b) describes a situation where an online community shares information about internal quality standards set by a particular fast food company and how these quality standards are often ignored in the company's own restaurants. Without knowledge about the newsgroup, such discussions could be interpreted as 'fast food bashing' but in fact the community is a 'fan community' consisting mostly of fast food lovers.

Then, even if search technology detects mentions of corporations or brands, this information is already disseminated. Web sites can be closed but this process takes some time and often the pages are already scanned by search engines, such as Google (URL <http://www.google.com>), that store images of pages indexed. Email cannot be 'removed' once disseminated over mailing lists and stored in personal mailboxes. Usenet articles can be deleted on some news servers but many servers do not honor cancel requests; private archives are mostly inaccessible.

To sum up, it would be naive to assume that it is feasible to 'monitor Internet traffic' in any more general sense.

## INTERNET ACTIVITIES AS CHALLENGE

E-business customers are online savvy *by definition* which makes companies involved in e-business easy targets. However, the example of the online community discussing the ignoring of internal quality standards in fast food restaurants indicates that the impact of information-level Internet activities is not limited to e-business companies.

We argue in particular that the challenge of information-level online activities demands an orientation from what is happening within corporate spheres of influence to the broader information environment. The most important thing in addressing information-level online activities is becoming aware of these activities as early as possible. However, delegating this tasks to dedicated teams that monitor Internet traffic is limited for several reasons. The three most important ones are:

Any technical approach to monitoring Internet traffic is severely limited (see above). It would be naive to assume that all Internet traffic could be monitored.

Every team (or, more precisely, every member of a team) has a certain perspective on the Internet and its information dissemination channels which means that his or her surveillance activities will focus on certain areas and pay less attention to others.

Especially small and medium enterprises may not even have financial and other resources that are required to set up specialized Internet surveillance teams. As Warren and Hutchinson (2000) report, even allocating resources required for undertaking (basic) security reviews may be a problem for such enterprises and monitoring online activities would require further resources. Similarly, hiring external specialists for monitoring Internet activities may be limited to large companies. There are expectations that outsourcing security to professional businesses will become common (Batten 2000).

These limitations suggest that information-based online activities should be addressed by establishing 'corporate awareness' which means that corporations *as a whole* should be on the alert. Such an approach requires a sound conceptual perspective and practical ways to implement the vision. In particular, individual awareness of the threat potential of information-level online activities needs to be increased in order to enable corporate awareness.

Corporate awareness, or distributed awareness, make use of specific characteristics of corporations as social groupings. Among other things,

- employees are people who are interested in different communities and information sources and who look at different online information sources;
- different employees may have a different understanding of what they read;
- employees may use different tools. Research has shown significant differences between what search engines cover (Lawrence and Giles 1998);
- employees may have access to otherwise inaccessible resources.

However, in order to benefit from these characteristics, a conceptual perspective is required that allows the following:

describe (and understand) the situation and  
organize necessary activities without requiring re-engineering of business processes.

We believe that research on distributed cognition and scaffolding minds provides the conceptual tools required. In the next sections we briefly the two research areas and outline how they can help to establish corporate awareness.

## **DISTRIBUTED COGNITION**

The theory of distributed cognition (Hutchins, 1995) seeks to understand the organization of cognitive systems but unlike traditional cognitive approaches, it extends what is considered as cognitive to include interactions between people and their environments:

'Distributed cognition looks for cognitive processes, wherever they may occur, on the basis of the functional relationships of elements that participate together in the process. A process is not cognitive because it happens in the brain, nor is a process noncognitive simply because it happens in the interactions among many brains.'  
(Hollan et al. 2000, page 175)

Settings that have been analyzed as distributed cognition systems are small sociotechnical systems such as an airline cockpit or the bridge of a ship. In the airline cockpit, for example, an examination of memory processes has found rich interactions between internal cognitive processes, the manipulation of objects and the traffic in representations among the pilots.

In the context of information-level online activities, we find it helpful to consider an organization along with its members as a distributed cognition system in which each employee contributes his or her capabilities and interactions with online environment without being expected to be capable of constructing the "big picture" of a situation.

## **SOCIAL SCAFFOLDING**

Apart from conceptual tools to describe and understand a company's situation, concrete techniques to implement activities are required as well. We refer to the perspective that humans are best described as scaffolding minds (Clark, 1997). This particular perspective suggests that human intelligent behavior is to a large extent dependent on structuring and exploiting the physical as well as the social environment. The human brain is viewed as a kind of highly-specialized "associative engine" and less as a device that performs extremely complex information-processing operations.

The assumption is that the human mind, i.e., the brain in its bodily context plus external structures, depends to a large extent on its capability to transform complex "information-processing tasks" into simpler associative tasks by exploiting structures of the real world and by actively re-structuring problems into series of simpler problems so that they better fit the peculiarities of human cognition. Indeed, much of the environmental interactions consist of iterated series of relatively simple pattern-matching operations. The re-structuring of problems in the scaffolding perspective, however, should not be confused with the de-composition of problems as done in computational divide-and-conquer approaches. The latter is an abstract activity that can be performed in isolation from the embedding situation whereas the "simpler problems" that result from the re-structuring of in the scaffolding perspective still are part of the ongoing interaction of the human with the environment (Lueg, 2001a).

Similar to the distributed cognition perspective, the scaffolding minds perspective suggests that human cognition cannot be investigated without embodiment. In addition, the scaffolding minds stresses that human minds depend on being embedded in a well-structured ("scaffolded") environment created by human minds. Examples for corresponding external structures are physical, symbolic and social-institutional structures.

## **PUTTING TOGETHER BITS AND PIECES**

In Lueg (2001a) we have described an example of 'information scaffolding' in an academic research environment. Individual members of the lab forward important scientific or organizational information to the head of the lab. Members focus on their particular research topics (which reduces the complexity of each member's "task") whereas the scaffolding contributes to the "informing" of the lab's head. In a way, the lab can be regarded as an 'information ecology' with different niches occupied by different researchers. An information ecology is defined as a system of people, practices, values, and technologies in a particular local environment (Nardi and O'Day, 1999).

In the context of information-level security management, the distributed cognition perspective allows to understand threat recognition as a cognitively distributed activity. By this we mean that observing online activities and interpreting these activities in relation to the company can be done by different minds mediated by technology. Observing online activities may happen whenever employees interact with the Internet and its information sources. However, employees are not required to have the expertise to assess the threat potential of online activities which makes observing a cognitively less demanding activity. Social scaffolding supports the forwarding of information concerning activities recognized to the relevant departments which have the expertise to further investigate and handle activities observed.

It is important that information concerning activities detected is not kept but shared with others. As Lichtenstein and Swatman (2000) report, knowledge of regular Internet security matters is often available on lower levels in a company but effectively blocked at this point of the managerial chain to the top. It is reasonable to assume that similar block effects could occur in the context of threatening online activities.

Our approach to corporate awareness is related to Batten (2000)'s approach to distributed security. A significant difference, however, is that Batten's first step -prevent- is hardly applicable in the case of information-level online activities as relevant activities happen outside the scope of corporate influence. Our approach also relates to Lichtenstein and Swatman (2000)'s holistic point of view but we broaden the focus of attention to include an organization's environment. This does not imply, however, that the organization itself becomes less important or deserves less attention.

## **TECHNICAL SUPPORT FOR DISTRIBUTED SECURITY MANAGEMENT**

Information systems technology can be used as mediator between the different minds involved in corporate awareness. A shared (information) system is an information system that is used by multiple communities of practice (Pawlowski et al. 2000). Pawlowski et al. describe how information technology (IT) professionals supporting shared information systems learned about their stakeholder communities and their specific characteristics. Maintaining shared systems is challenging as system changes may be triggered in any of the stakeholder areas while effecting other areas. Pawlowski et al. argue that the IT group observed has acquired an amazingly broad view, spanning both the informal boundaries of communities and the formal organizational boundaries. In particular, the authors argue that the professionals are put in brokering roles (brokering in the sense of Wenger, 1998) and discuss how they could be used to enable knowledge transfer among communities. In the context of this paper, shared information systems would be used to support propagation of information about threatening online activities.

## **RELEVANT DISCIPLINES**

It is important to involve other disciplines apart from those traditionally concerned with security management. For example, lawyers are becoming more and more interested in what has been called 'commercial terrorism through the Internet' (Braun et al., 2001) in a rather controversial article.

Public relations has some expertise in coping with information-based online activities and has been involved in addressing some information-level online activities. Brauer (1998), for example, describes how a company specialized in public relations was hired to stem the damage caused by an Internet fraud.

Disciplines dealing with handling information, such as information and library science, can be expected to have some valuable expertise. Ebbinghouse (2001), for example, has collected a lot of information on how to handle threatening situations such as cyber smear and revenge web sites once they have been recognized. Examples discussed range from complaining to the owner to "bringing in the cavalry" which would be the relatively new Internet Fraud Complaint Center (which is located in the US and probably not too helpful in other countries) to launching a law suit.

Finally there is a discussion among privacy and free speech advocates whether corporations will use the new monitoring technology to suppress legitimate online dissent (Kumar, 2001).

## **CONCLUSIONS AND FUTURE RESEARCH**

In this paper, we have outlined how research in distributed cognition and social scaffolding can be used as conceptual tools for novel approaches to coping with information-level online activities. The contribution of this paper is that we have related security management issues to recent advances in research on human cognition and behavior. The need for novel approaches is based on the understanding that virtually unlimited information dissemination in the Internet may be a serious threat to companies.

Future research in this area includes investigating in more detail how distributed cognition and social scaffolding can be supported by appropriate technology. We are also working on conceptual tools that support the assessment of Internet activities and their threat potential (see Lueg (2001c) for first results).

## **ACKNOWLEDGMENTS**

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# Porter and Profit: On-Line Newspapers Prove the Point

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## ABSTRACT

*The Internet is making a place for itself in the Information Age but not at the expense of traditional media such as newspapers against which it is squeezing into the market. The Internet is becoming another alternative information source at a time when consumers are showing an ability to absorb more information channels, as happened with the advent of radio, television and films. This paper compares in the context of two of Michael Porter's competitive models the business viability of the Internet-based virtual e-paper with the traditional newspaper. It finds the newcomer unable to meet criteria critical to profitability, thus raising questions about its stand-alone viability.*

*Keywords: newspapers, media, Internet, Porter, delivery, information, economy, profit*

## INTRODUCTION

The Information Age is developing an increasing variety of distribution channels to disperse traditional forms of packaged information, i.e. text, sound and image, that in the early, transitional stages of the new era posed challenges to established systems such as newspaper, radio and television. It is clear that traditional economic fundamentals apply to old-business and e-business alike as the first wave impact of change associated with the implementation and wider use of new technologies becomes understood and rhetoric gives way to reason. This paper compares the viability of traditional and on-line newspapers and concludes on the results that the paperboy will hold onto his delivery round as newspapers emerge strongly viable in the electronic information age.

The newspaper is preferred over the Internet by the current generation of users for delivery of news and information and shows no sign of being weakened as an information supply and transportation industry. A study (Stempel et al, 2000) of the relationship between growth in Internet use and changes in media use found that while the Internet had arrived as a major mass medium, it was not playing the role that many assumed. Changes in Internet use from 1995 to 1999 revealed that any decline in use of TV news, newspapers and magazines could not be blamed on the Internet. It found that Internet users were more likely to be newspaper readers and radio-news listeners than were non-Internet users.

The authors' found those using the Internet as a source of news were clearly information seekers. Internet users may turn to their newspapers or newspaper readers may go to the Internet for more information on a given topic, both being sequentially possible as a supplemental information-seeking behaviour. Less logical was going from either the Internet or the newspaper to TV news to seek additional information. An independent similar study in the United Kingdom confirms the findings (BMRB Research, 2000). It found that news and sport overwhelmingly attracted visitors to newspaper sites with business/finance also having strong appeal. Independent industry surveys that show user growth in both media back up such behavioural trends in regular reports. Newspaper sales measured over a six-month period, April-September in 2000 (Anonymous, 2000) by the Audit Bureau of Circulations, increased modestly in the major cities of the United States. Measured web site visits in

June 2000 (Nielsen/NetRatings) showed sizeable increases in audience, in four instances for the most popular sites in quantities exceeding one million.

Wurman (2001) believes the information explosion is showing humans can handle increased information channels, such as easily switching between the morning paper and surfing for financial news, that we have increased appetites and can cross platforms. Hence the market-entry of a new medium without decimating an old medium. The amount of information generated by the technology age has been studied by a team from University of California at Berkeley (Lyman and Varian, 2000) which found the world produces between 1 and 2 exabytes of unique information per year, roughly 250 megabytes for every man, woman, and child. (An exabyte is a billion gigabytes, or 10<sup>18</sup> bytes). Soon it will be technologically possible for an average person to access virtually all recorded information.

The study underlines the point that data and delivery systems are available for every IT connected person. The researchers were surprised by the "paucity of print" with printed material of all kinds making up less than .003 per cent of the total storage of information. They noted this did not imply that print was insignificant, rather it meant that the written word was an extremely efficient way to convey information. The main focus of the report was on the supply of information but it is interesting to look at data measuring the consumption of information as well. Table 1 depicts hours per year of time spent on various media in US households in 1992 and in 2000.

**Table 1: Summary of yearly media use by US Households in hours per year, with estimated megabyte equivalent. (Hours from Statistical Abstract of the United States, 1999, Table 920 (projected).**

ITEM	1992 Hours	2000 Hours	2000 Mbytes	% Change
TV	1,510	1,571	3,142,000	4
Radio	1,150	1,056	57,800	-8
Recorded Music	233	269	13,450	15
Newspaper	172	154	11	-10
Books	100	96	7	-4
Magazines	85	80	6	-6
Home video	42	55	110,000	30
Video games	19	43	21,500	126
Internet	2	43	9	2,050
Total:	3,324	3,380	3,344,783	1.7

\* Lyman and Varian (2000)

Worth noting are hours spent on TV and radio consumption and their consistency over time, reduction in time on printed information and the dramatic increase in home video, video games, and Internet usage. Total time spent in media access has hardly changed in eight years.

Contrary to the self-generating hyperbole of the Internet, manufacturers of the newspaper printing press are looking forward to a strong start to the first decade of the new century. There is demand for new printing equipment, owing to newspapers' needs to add colour capacity and control waste, and advances in press technology are making it feasible for publishers to replace presses that are less than 20 years old (Rosenberg, 2000). New technology could make the digital printing press a possibility within the next 20 years.

A workable, i.e. profitable, business model to enable the paper to change its hard copy presence and migrate all to the Internet has so far eluded the newspaper which is the founding format of information transfer. It is doubtful, as this paper outline that a model exists which will allow the traditional newspaper economic structure to be replicated in a paper-less, Internet environment. Venkatraman (2000) believes publishing is likely to be significantly reshaped by the Net, even though dominant new business models with assured profitability have yet to emerge. Like most businesses, newspapers are built on a vertically integrated value chain. Newspaper companies exist as intermediaries between the journalist and the reader because there are enormous economies of scale in printing and distribution. But when high-resolution electronic tablets advance to the point where readers consider them a viable alternative to newsprint, those traditional economies of scale will come under greater pressure. Readers could be able to mix and match content from a virtually unlimited number of sources (Evans and Wurster, 1997) when free from the necessity of subscribing to entire physical newspapers. This deconstruction process, or un-bundling, can happen now with electronic news, movie reviews, recipes and weather able to be accessed from different sources. The newspaper remains, though, an extraordinarily cheap and user-friendly way to distribute information, which sustains the traditional business model.

## COMPETITIVE PUBLISHING ENVIRONMENT

The task of newspaper publishing is primarily to collect, package and deliver news and information in a timely manner, an expertise which is transportable by other delivery systems such as the Internet. In the new paradigm, the critical negative barrier in the value-chain for newspapers is the free, front-end electronic delivery system that fundamentally deconstructs the existing contract relationship between supplier and customer. The result is the newspaper forgoes revenue because it isn't charging for the physical product.

Newspapers are collaborating with technology to shore up their competitive position as they deal with the new information economy environment. Just as they bought start-up radio and television stations in previous generations, publishers are establishing Internet operations and forming Web businesses to protect their newspaper franchises. They are publishing on-line versions of the daily or weekly newspaper under the same brand-name with variations of the same news and information. If the Internet was to damage any other medium, the newspaper was a prime candidate. Its physical format has changed marginally since the invention of the printing press but the technology is still linked to reels of paper and electronically-smart iron presses. The Internet is all the newspaper cannot be as a delivery system. It is fundamentally text-based (as is the newspaper, and the similarities are telling) but with flexibility to splash around colour and add moving visual lures. Whereas the paper needs to go to press late at night to be physically delivered in time for morning consumption, the on-line version's content deadlines are more fluid, being able to be changed at will for access at will. Where earlier phases in a story's development have to be sourced back through previous days' newspaper editions, the on-line service can offer an accessible archive. The newspaper is purely mono-media, unable to carry sound-bites or video grabs or facilitate inter-facing chat lines with reporters or story subjects. As it did, however, because of habit, convention and convenience through the advent of silent pictures then talkies, radio and TV, the newspaper has survived the initial phase of the Information Age. The new technology needed to be something a bit more than what it was, despite its bells and whistles, to make the centuries' old tradition of newspapers disappear.

## CHALLENGE FACING PUBLISHERS IN THE E-BUSINESS ERA

The challenge for newspapers is to find a new business model matching the new technological media or manipulate an old one to replace revenue lost in transition from the traditional format. Virtual newspapers have been set-up in the interim by traditional operators to establish an electronic foothold, to protect the turf and as brand extensions. Two of Michael Porter's competitive models have been applied below to compare the sustainability of the traditional newspaper format against the web-based version to ascertain their competitive resilience. The comparative diagrams Figure 1 and Figure 2 are indicative of the different models. Porter (2001) recognises the Internet as an important new technology but warns of the danger of assuming it changes everything to the extent that the old rules about companies and competition become obsolete. He recommends it is time to take a clearer view of the Internet and see it for what it is: an enabling technology, a powerful set of tools which can be used in almost any industry and part of almost any strategy. The great paradox of the Internet, he says, is that its very benefits – making information widely available, reducing the difficulty of purchasing, marketing and distribution and allowing buyers and sellers to find and transact business with one another more easily – also make it more difficult for companies to capture those benefits as profits.

## OFF-LINE, ON-LINE AND THE FIVE FORCES

Porter (1980) contended that the state of competition in an industry depends on five basic forces and the collective strength of those forces determined the ultimate profit potential of an industry. He said "in the economists' perfectly competitive industry, jockeying for position is unbridled and entry to the industry very easy". This kind of industry structure, he said, offered the worst prospect for long-run profitability but the weaker the forces collectively, the greater the opportunity for superior performance. The traditional and web-based models of a newspaper are examined on merit in the context of each of the forces.

### Threat of Entry

Traditional: Highest costs are materials and labour so a start-up operator needs substantial capital to sustain old technology practices. Market dominance and product loyalty is costly to break for a new entrant. There are

significant transport costs from factory to consumer but all distribution channels are easy to access. A maturing industry with strong cash-flows whose buy-in price could be a deterrent.

**Web-based:** Start-up cost is relatively cheap with few consumables required. Labour costs are not as great, depending on the range of information planned for inclusion on the web site. No transport costs as the Internet is the distribution channel. There are extensive marketing costs to attract consumers but the audience is limited by its access to technology. Nil cashflow will come from on-line usage, or hits, and minimal cashflow from advertising, commensurate with an audience not as large as newspapers or television.

*Verdict:* Traditional version is established but cost-bound and generating profits; Web version appears to offer ideal operating environment but generating little cashflow.

### **Powerful Suppliers**

**Traditional:** Materials and labour are cost centres critical to the business and subject to price maintenance, foreign exchange fluctuation, industrial environment and market demand. The business model relies on specialist distribution channels from factory to consumer which are subject to fluctuation in labour, fuel and consumable prices. Industry members are important to supplier groups that tend to sector-specialise.

**Web-based:** Labour is the only significant cost centre after start-up; establishment of distribution channel has minimal comparative cost. No supplier is capable of disrupting the business.

*Verdict:* Traditional version burdened by costs and complex partnerships; Web version has no such baggage.

### **Powerful Buyers**

**Traditional:** Newspaper purchasers and advertisers buy in large volumes, are cash-flow positive to the business and therefore cover major costs. However they are cyclical, fair-weather customers who cancel when they go on holiday or have long-weekends.

**Web-based:** Out-goings on labour cannot be off-set by unit purchase as the Internet is free; some newspapers are having moderate success in charging advertisers a listing fee for inclusion on their web-site. Web-site visitors have not yet proven to be habitual.

*Verdict:* Traditional version has customer relationships that generate benefits; Web version has no such loyalty relationship with users and no facility to charge.

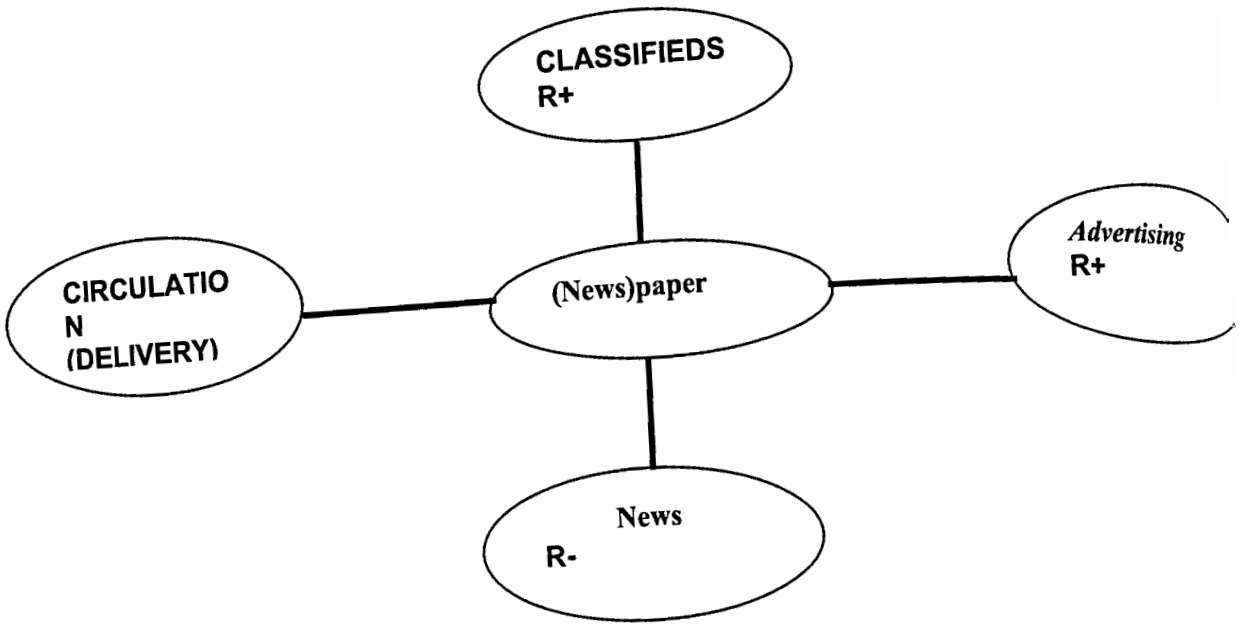
### **Substitute Products**

**Traditional:** Television, radio, cinema, books, Internet are competing for the newspaper reader's time and attention. There are low switching costs and a varying propensity to substitute. All media are price sensitive.

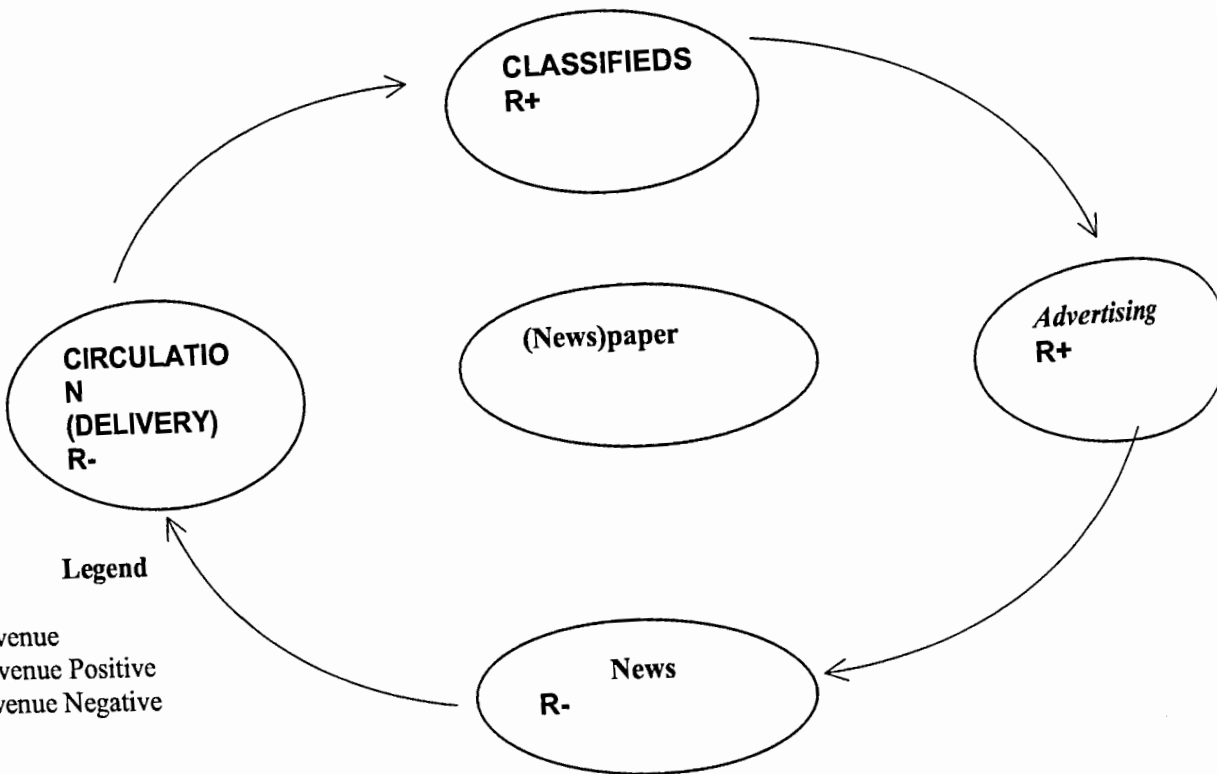
**Web-based:** All of the above plus hundreds of thousands of other Internet sites. Favourable price sensitivity, i.e. it's free; high propensity to substitute.

*Verdict:* Both the traditional and Web version exist in a crowded environment but only one gets paid for its output.

**Traditional Paper  
(Figure 1)**



**Virtual E-Paper  
(Figure 2)**



**Legend**

R = Revenue  
 R+ = Revenue Positive  
 R- = Revenue Negative

## **Industry Competitors, Rivalry**

Traditional: mature industry; high fixed costs; strong brands; diversity of competitors across the media spectrum; powerful corporate identity; strong product differentials between rivals; high exit barriers.

Web-based: blue-sky industry; low fixed costs; no stand-alone brand identity; diversity of competitors across the media spectrum; no corporate identity or power; strong product differentials between rivals; low entry and exit barriers.

*Verdict:* The traditional version is a bulwark against a brash alternative.

## **AND GENERIC STRATEGIES**

Porter (1985) believes there are but two "basic types of competitive advantage a firm can possess: low costs or differentiation". These combine with the "scope" of a firm's operation (the range of market segments targeted) to produce "three generic strategies for achieving above-average performance in an industry: cost leadership, differentiation and focus".

### **Cost Leadership Strategy**

Traditional: Newspapers bear heavy production and labour costs but strive to sustain cost efficiencies to deliver and market a product more efficiently than competitors. Lower costs allow the business to earn adequate returns under heavy competition and benefit from increased volume sales.

Web-based: Production and labour costs are minimal in comparison to the traditional version but so is revenue. No amount of cost control will be reflected in more "hits" revenue because the user is not paying for the service.

*Verdict:* The traditional version returns more to the bottom line if costs are reduced but in the Web version this, importantly, reduces losses.

### **Differentiation Strategy**

Traditional: Buyer loyalty is generated by the newspaper's unique and superior value to customers in terms of product quality, current content, home delivery and value added sections. If it can generate strong sales, the company is rewarded by being able to charge a premium for its advertising space or additional special products.

Web-based: The service is free so the consumer does not judge its relative value and therefore the degree of buyer loyalty is immeasurable. If the site is successful in attracting "hits", a premium can be charged for advertising space. Content is also important however the interactive and colourful nature of web sites create a vastly different "information absorption" environment.

*Verdict:* The traditional version potentially generates greater value and yields with its differentiation strategy whereas the result is minimal for the Web version.



## Focus Strategy

Traditional: Product differentiation strategies are often focused on narrow segments of the market by one-off promotions, improved services at different times to cover events such as elections, budgets and tragedies and initiatives to generate more sales, i.e. home delivery. There is also the potential to enhance perceived quality and thereby add value.

Web-based: Differentiation focus is more possible because of the interactive nature of the Internet and sound and video bites of content subjects have a standout advantage over the newspaper.

*Verdict:* Each version is equally able to benefit from focused differentiation however the traditional approach results in more newspaper sales and hence cash.

The ultimate verdict of the two studies is that the traditional strategy rejects the Web-based business for its most outstanding flaw, the inability to generate a replicable amount of cash.

## CONCLUSION

The traditional newspaper business model is more economically robust in comparison to an on-line version. The model under which newspapers have operated, charging to buy the product as well as charging to advertise in it, stands up to scrutiny under Porter's Five Forces and Generic Strategies principals. The on-line version fails the test for lack of revenue but that is a multi-dimensional problem that goes to many aspects of the value chain. Ultimately, the expertise of the publisher is to collect, package and disseminate information. The advent of the information economy era has caused traditional publishers to reassess, in context of the rapid acceptance of new technology and its suitability as an information delivery system, the future methods by which their products will be presented. The new technology offers radio-immediacy delivery of text but operators are unable to offset the full cost of business by charging a reasonable fee. Without a profit, the potential of the medium in publishing may not be fully realised.

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# E-commerce, Management Information Technology and the Organisation: A Study of Factors Influencing Change In a Large E-nabled Company

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## ABSTRACT

*E-commerce has been flagged as the catalyst responsible for creating global competitive markets, changing the business process interface, and challenging the structure, culture, and management practices of the traditional, hierarchical organisation. It is foreshadowed that businesses will need to restructure in accordance with this new order if they are to be competitive, and indeed survive, in a technology driven, global economy. An exploration of the principal factors driving change appears, on the whole, supportive of this prognosis. However, some inhibiting factors have emerged, which suggests that the breadth of change is very much dependent on the organisation culture and structure, and the industry regulators.*

*Keywords: E-commerce, Organisation Structure, Organisation Culture, Management Information Technology*

## INTRODUCTION

There appears to be little known about the impact of e-commerce on the organisation structure, culture, and the management of information technology. This exploratory study was undertaken to provide an insight as to how one organisation manages global e-commerce solutions, specifically, in terms of the organisation structure and culture, and the management of information technology.

In 1998, Boudreau et al stated that, over the last 12 years, sweeping changes aligned with 'customer demands', 'industry regulations' and 'technological innovations' had created global competitive markets, which have challenged traditional organisational and management strategies. They also acknowledged that organisations had to restructure accordingly, if they were to be competitive in the global market place (Boudreau et al 1998).

These market transformations have evolved through a combination of the Internet and interactive technologies (Australian Government 1998a) and, subsequently, comprehensive 'new management approaches' were needed in order to maximise e-commerce opportunities (Kalakota & Whinston 1997).

Kalakota & Whinston (1997) acknowledged some difficulty when attempting to define electronic commerce, stating that its terms of reference were underpinned by any number of the participating intermediaries. However, in board terms, e-commerce is defined as 'doing business online' through a mix of technology and business strategies. The Global Information Infrastructure Commission (GIIC) describes e-commerce as embracing all electronic networks and technology used in the conduct of electronic transactions and/or other economic activity (1998).

For the purpose of this paper our definition of e-commerce will align with the definition provided by the GIIC.

A review of the literature found no previous research concerned explicitly with the impact of e-commerce on the management of information technology and the organisation structure. Some research had analysed changes in the key issues of the management of information systems, indicating that the management of information technology principles had changed and that the reported change was largely attributable to the impact of e-commerce activity. Other research had reported on the change management principles and outcomes of organisations' adoption of information technology. It was shown that structured (hierarchical) organisations were more likely to resist technological change.

Most e-commerce research, in Australia, had targeted small-to-medium sized business use of e-commerce. Although, a very loose comparison could be made between some of the findings outlined in the National Office for the Information Economy (NOIE) survey (June 2000), and the outcomes of this study, the survey targeted small-to-medium sized businesses rather than large businesses.

The purpose of the study, upon which this paper is based, is to provide some understanding of the interrelation between e-commerce, the organisation structure and culture, and the management of information technology. This information, in turn, could be used by other organisations to make informed decisions as to appropriate e-commerce solutions.

The following section will outline the research approach chosen to implement this study, along which this paper is based. The object of the study will be identified and the preliminary data analysis derived from the interviews will be described in the context of the findings.

## **RESEARCH METHODOLOGY**

### **Research Approach**

The following research subproblems are being addressed in the study:

What is the organisation's scope and level of e-commerce activity?

What are the organisation's management of information technology principles and has there been any change since the implementation of e-commerce?

What is the organisation's structure and culture?

Have the organisation structure, culture, and the management of information technology principles changed, and if so, are these changes related to the implementation of e-commerce?

In the absence of any related, researchable outcomes - measurable objects and their relationships - the purpose of this study is to 'explore' and 'describe' a situation at a given point-in-time. This type of research is best suited to the qualitative research method (Leedy 1999).

## Participants

We required that the chosen organisation was Australian owned, or at least based in Australia, had both national and global business interests with high level e-commerce activity, and had to fit the description of a large sized organisation. For the purposes of this research we used the Australian Bureau of Statistics definition of a large business, which is defined as having 200 or more employees (Australian Bureau of Statistics 1999).

The organisation finally selected to participate in the study had shown considerable growth in the short period since entering the global market, and it was felt that this organisation would provide a clearer picture as to how a large business manages global e-commerce. There was also a strong technology focus, which was considered an excellent base from which to explore the impact of e-commerce on the management of information technology.

The business is a global, financial service provider and technology organisation that manages over 52 million account holders worldwide. Established in 1978, the company, which for ethical reasons we shall refer to as 'ShareTradersOnline', was a local, niche, technology company totalling approximately 30 - 40 staff members. In 1994 it embarked on the acquisition of Australian and New Zealand finance businesses, and in 1997, entered the overseas markets. 'ShareTradersOnline' now provides a range of technology products and financial services to over 15 countries.

This study focused on gathering information from the high-end decision makers within the organisation's respective, strategic business components. Taking this approach provided a broad overview of the issues associated with the research problem and by not focusing narrowly on one aspect of the problem, information could be drawn from a range of related components.

## Data Collection

According to Myers' (1999) description of qualitative data techniques it was decided that a case study would best serve to 'describe', 'explain' or 'evaluate' the research problem. In the light of the research aims, the study needed to focus on describing the situation and in choosing the case study approach, open-ended interviews were used.

The interviews were recorded with the approval of the participant and manually transcribed immediately to ensure their accuracy, then returned to the interviewee for verification (Seidman 1998). In addition to the interview materials, the study has also incorporated the relevant textual materials and documents provided by the organisation.

## Method of Analysis

Creswell (1998) has identified case study data analysis as relying on 'description', 'themes' and 'assertions' with research findings best conveyed using the 'narrative form'.

As this research was an explorative, single case study it was deemed inappropriate to use a data analysis technique that was based on tables, matrices, figures, or any other structured reporting process. There were no known datasets to compare, group or codify. Instead, the free-flowing interview profiles, literature and other data materials, were combined to provide a preliminary snapshot of events at a given point in time, exploring the interrelation of e-commerce, the organisational structure, and the management of information technology.

## PRELIMINARY ANALYSIS OF DATA

A comparative analysis of the literature, textual materials and documents provided by the organisation, and the data derived from the four, initial, open-ended interviews will form the basis of these preliminary findings. Each of the four interview data represents an operational component of 'ShareTradersOnline', the organisation chosen for this case study.

The object is to explore the factors that influence the interrelation of e-commerce, the organisation structure and culture, and the management of information technology. This was undertaken by first identifying, then comparing any recurring issues arising from the interview data, and the existing literature. Although, the analysis of the data is by no means exhaustive, some distinctive factors are already emerging. What follows is a description of those factors.

### The Organisation Structure

Three of the four interview participants, representing four of the organisation's business units, described the organisation structure as 'flat'. It was also said to have a 'fluid structure', in that the business was geared to respond readily to global market demands and opportunities.

Each business unit is serviced, at the 'regional level', by the common support areas, Finance, Human Resources, Development and Training, and Marketing, for example. Three of the four participating business units have a global operational focus. The fourth unit, Financial Services, has functionality at the regional, and local levels. Each of the local divisions operate on a 'stand-alone' basis, and are responsible for their 'end-to-end' processing operations.

There is a 'global team', comprising a representative from each of the main business units, who work together to ensure that the business units maintain objective consistency within the regional, local, and global market place.

### The Organisation Culture

The organisation culture is collective of the 'enterprise and its members', and comprises, in part, the vision, behavioural standards, value judgements, principles and practices, and business acumen of that organisation (Morden 1996).

The term 'schizophrenic' was used to describe this company's culture because of the two distinct cultures that co-exist. First, there is the culture that is flexible, has an 'open door policy', and is said to represent the 'organically grown' (original) components of the organisation. It also includes those business units that were newly formed under the company's global expansion.

The other culture was said to have evolved from the organisation's acquisition of established, hierarchical structured businesses. These businesses were described as being 'very old fashioned', and 'very process driven'. They had traditionally been components of accounting firms or banks, and their business practices were heavily controlled through departments, divisions, and heads of business. Once acquired, these businesses were merged into the Financial Services business unit.

Even though there is more open communication, and free-flow of information within this business unit than there was three or four year's ago, there are still cultural differences between the components of the original organisation structure, and those businesses that were acquired.

'When you put those organisations together and grow them into a business, which is owned by "ShareTradersOnline", with its culture, and whilst there has been a blending of the two, Financial Services, which has come from an established traditional background, has still got some of that baggage - in fact lots of it. There is a distinct difference in culture and operating procedures'.

The decision making process is one example of the cultural differences that exist between the two organisation structures.

There are, effectively, two decision-making streams within the organisation. The first method comprises the 'corporate level', which is a relatively 'informal' process involving a Board of Directors, who oversee the 'big ticket items' - those projects that 'significantly commit the organisation'.

The second method is a more formal process that is applied to the organisation's structured business units (Financial Services).

'Financial service providers are significantly risk management businesses and they have quite formal decision making structures within them.'

'It seems that we can make big decisions that have big impact seemingly quite quickly, but when it comes to incidental type decisions that have a minimal impact on the organisation overall, it seems to take forever'.

Another cultural difference is the business process. There are two business processes that coexist within Financial Services. There is the internal business process, which is electronic based, 'automated and streamlined', then there is the external business interface, which is very much paper-based.

'The interface with shareholders is very old fashioned, they are all streamlined forms but it's still bits of paper that goes in the mail and comes back to us in the mail'.

'ShareTradersOnline' other business components are said to be technology driven, in that their business processes are largely based on the dissemination of information, which is predominantly electronic activity.

'We are leaning more and more toward technology and what the technology can give us'.

'We are now doing a lot more stuff on the web. Web delivery to customers who are companies, whose finances we run, and web delivery of services to those company clients, which is sort of fattening the relationship up'.

A commonality across the business units is a commitment to client service strategies. All enterprise units are committed to adding value to their respective client relationships, and this strategy forms part of the organisation's overall business culture.

The Internet is considered a strategic tool that could play an even larger role in the organisation's 'value-added equation'.

'As a business we are going to be delivering more and more electronically to clients. There is no question in my mind about that.'

'There are things that a client has to do by law. We constantly value-add by making those tasks smarter, better, quicker, and cheaper'.

E-commerce, the Organisation and Change

Information Technology was described as the organisation's core competence, and consequentially, the biggest influence in the decision-making process. Technology was where the organisation initially started, and to 'keep abreast of the world, which is what the organisation does, there's a lot of focus on developing new technologies'. E-commerce, specifically web technologies, is currently the organisation's biggest development area.

Web enabling technologies, or e-commerce, have brought considerable change in the workflow activities of the respective business units. There has been an increase in the electronic interchange of information, both internal and external, at every operational level, which has streamlined many business processes. Historically, clients were provided with 'hard-lines', a 'classic one-to-many' network arrangement, supporting the business transactions.

'Now we have our global web development.....the webserver is attached to every system that we have in the world. That's a perfect example of how one development can cater for a global requirement, which it does in terms of seamless collaboration between the US, and North America, the UK, and here.'

As the organisation became more globally focused, only minor changes were required in the technology management practices.

'There are certain things that we need to do now that we have got bigger and global. We do Board reporting and we do things like formal reviews, salary planning, and budgets. That's the only thing that's changed in terms of technology management practices.'

There is one exception. The organisation has always managed its own technology infrastructure, but given its global operations; there is now a need to enter into contractual arrangements with third party, 'telco providers'.

'We had some hick-ups, and some teething problems about letting go of that responsibility overseas. We've always done all of our own things, and if something goes wrong - to have a third party - they don't react as quickly as we would like them to in certain instances. That's something that is quite difficult to adjust to.'

As recent participants in the global market, the organisation has adopted various types of e-commerce, strategic relationships, for example, partnerships, alliances, and preferred providers. Alliances were said to be more business driven than technology driven. It's about adding value for all parties concerned - a concept that was said to be 'old, but new'.

It was also acknowledged that, an organisation requires a different approach to business development in a global, e-commerce, market place.

'Anyone who's got a three-year business plan doesn't understand what is happening in the world. Because no one knows what it is going to look like in three year's time'.

In the global market, an organisation needs to be flexible about how it implements its strategies and achieves its objectives.

Within this organisation, global, e-commerce activity has been the driver of change at the structural and cultural level. There is now a 'global management team' that oversees the organisation's global business operations, and most of the business units have been restructured or redefined, so as to reflect the organisation's expanding global activities.

'The way technology is, is that the finance retail investors are getting much more access to international markets so that they can broaden their risk base and their investment strategy much more. We understand what the needs of the markets are. We can see where the technology is going.'



## PRELIMINARY FINDINGS

The consensus of the interviewees was that, 'ShareTradersOnline' had changed considerably as a result of e-commerce, and its global expansion. This change was considered for the better. However, with respect to Financial Services it was acknowledged that while there had been some change, it had been less dramatic. These changes, although minimal, were considered to be positive. From a technology viewpoint, it was said that the Financial Services business unit was slowly coming to terms with these change driven technologies.

'Part of the industry that we've been in, - we've come from a banking and accounting industry - people aren't apt to change (technology). So you do have to have a technology arm in those types of businesses to drive that business forward'.

Its legislative framework also binds the Financial Services industry. There is some business transactions that can be done electronically - are physically achievable - but are not legally allowed. Clearly, there are some legislative issues that are impeding the progress of some electronic transactions.

Another factor influencing change is that in many cases the finance businesses that were acquired by 'ShareTradersOnline' already had established support departments, which had developed a 'silo mentality'. These businesses were 'looking after their local business needs in isolation of any global considerations'. A consequence of this was said to be the fragmentation of the organisation's overall image.

Proposals to establish a global perspective were initially met with opposition from the Finance Services business heads because it entailed changing their organisation structure and culture. With much persistence, the latter end of 2000 saw the elimination of the 'local' support departments, in favour of a 'global' strategy. Decisions that impinge on the company's overall corporate strategy have been removed from the local operational level. Eventually, the term 'global' will be phased out as the corporate strategy focuses on servicing the organisation's international businesses.

## SUMMARY AND FURTHER WORK

There are a number of factors attributable to the drivers and inhibitors of organisation change in this particular e-commerce environment. This research has identified the emergence of two very distinct influences, namely, organisation culture and structure and, an industry related regulatory framework. The ability of this organisation to effect change in an e-commerce, global environment appears to be dependent upon these factors. As demonstrated in this study, organisation restructure does not necessarily secure an e-commerce interface. In this instance the transition from paper-based to electronic processing has, to some extent, been inhibited by the controlling framework of the finance industry.

There are a number of other change factors such as global change management, the role of internal company politics, and external influences that require further work. Another emerging issue is the way the strategic planning process is handled given that the company sees the market place as changing very rapidly. These all require further exploration from the case organisation perspective, and will be reported on at a later time.

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Accessed 16 Sept 2001.

# The Characteristics of Goods, Web Site Features and Added Value: A Decision Chart

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## ABSTRACT

*This paper describes some exploratory research that is designed to help businesses to maximise the application of Internet technology to add value to their product or service. It uses the type of Consumer Good as a basis to develop a decision chart to help organisations to identify ways of adding value to a Consumer Good using Internet technology. It provides a classification scheme that businesses can examine in relation to their goods. The 'classification path' that they follow leads to the suggested internet features that provide added value for the consumer.*

*Keywords: Internet; Added Value; Consumer Good; Decision Chart*

## THE IMPORTANCE OF THE INTERNET

This paper describes some preliminary research that is designed to help organisations to maximise the application of Internet technology to add value to their goods. It incorporates the proposition that the type of Consumer Good can be used as an important determinant of the successful application of Internet technology. The main purpose of the research is the development of a decision chart to help organisations to identify ways of adding value to a Consumer Good using Internet technology. This paper describes the development of the initial decision chart.

The importance of web site design, promotion and evaluation are recognised as being important to a firm's web site strategy. These important issues are not the focus of this paper.

## ADDING VALUE USING IT AND THE INTERNET

It has been recognised for a number of decades that the use of computers can provide cost savings and improvements in efficiencies in many organisations. Porter and Millar (1985) have generally been credited with recognising that the capabilities of information technology can extend further to providing organisations with the opportunity to add value to their goods. Value is measured by the amount that buyers are willing to pay for a product or service. Porter and Millar (1985) identify a number of ways that organisations can add value to their commodities or services (known as *generic strategies for improving competitiveness*). One way is to be the lowest cost producer (an organisation produces a product or service of similar quality to competitors, but at a lower cost). Another way is to produce a unique or differentiated good (providing value in a product or service that a competitor cannot provide or match, at least for a period of time).

IT can be used to differentiate to goods in a number of ways (Sandy and Burgess, 1999):

**Quality:** this relates to product or service traits (such as durability) that provide a degree of excellence when compared with the goods of competitors.

**Product Support:** the level of support provided for the product or service. This can include information on how to use the product, product replacement/return strategies, and so forth.

**Time:** this works on the concept that buyers will pay more for a good that is provided/ delivered quickly, or will choose a product of similar price and quality if it is available now over a competitor's product that is not currently available.

**Personalisation/ Customisation:** this is the process of customising/ tailoring a product or service to the purchaser.

Other incentives, such as buyer loyalty ('reward') programs.

## ADDING VALUE USING THE INTERNET

Web site development is often incremental. Many businesses, especially small ones, do not start with a complex web site. Previous research of the authors (Sandy and Burgess, 1999) has linked the types of value added described in the previous section with some typical features found on these different types of web sites.

Table One summarises the link between levels of web sites, web site features (as listed by Burgess and Schauder, 1999) and types of added value.

Table One: Levels of Facilitation of Web Sites and Types of Added Value

Facilitation of Web Sites	Internet Feature	Added Value	Example of benefits to Consumer
Electronic Brochure (EB)	Product details	Cost	Lower price
	Information about the firm	Differentiation	Increased assurance about quality and reliability
	FAQ/ Product Usage Directions	Differentiation	Extra product support
EB + Order	Ordering Capability	Possible Cost Differentiation	Lower price More convenient ordering
EB + Order Plus Payment	Payment Capability	Differentiation	Faster delivery
Interactive Publishing	Direct goods download	Cost Differentiation	Lower price Faster delivery
	Personalisation	Differentiation	Individually customised products
	Frequent Purchaser incentive schemes	Differentiation	Extra (loyalty) benefits

## CLASSIFICATIONS OF CONSUMER GOODS AND THE INTERNET

Having established the link between Internet features and added value, this section examines the concept of matching consumer good properties with Internet features.

Peterson et al. (1997) have developed a means for assessing the suitability of the Internet for products and services with different characteristics. Three dimensions of product and service characteristics have been identified:

*Cost and Frequency of Purchase.* Goods vary from low cost, frequently purchased goods (such as milk) to high cost, infrequently purchased goods (such as a stereo system).

*Value Proposition.* Goods vary between being 'tangible and physical' and 'intangible and service related'.

*Degree of Differentiation.* This is determined by the extent to which a seller is able to create a competitive advantage by differentiation.

Peterson et al. (1997) argue that consumers are unlikely to search for a long time for low outlay, frequently purchased goods. They are still likely to buy goods such as wine or milk in a retail store, but will be more likely to buy goods such as stock market quotes over the Internet. This is more likely to be because of the speed in which they can get the goods. The purchase of high outlay, infrequently purchased goods allows the consumer more time to search for them and purchase is likely to occur either traditionally or on the Internet. With intangible or informational products where there is a high degree of differentiation (such as with software packages), the swiftness of delivery by direct download may cause some consumers to purchase over the Internet (Peterson et al, 1997). This classification of a good by 'differentiation' is not the most suitable for this type of exercise, as there are so many ways in which differentiation can occur.

There has not yet been a direct attempt to match the inherent properties of products with specific Internet features. In the remainder of this paper the authors will attempt to achieve this.

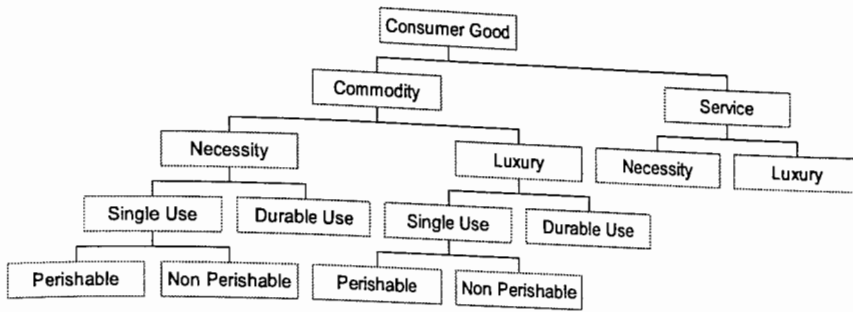
### Consumer Goods and Types

Economic theory, as found in any introductory text (Samuelson and Nordhaus, 1989; Jackson et al, 1994; Reynolds L G, 1988) postulates a world dominated by relative scarcity. The wants of consumers are unlimited, but the production of goods to satisfy these desires is limited. Thus, the role of an economic system is to provide a mechanism to distribute the limited goods amongst the consumers. A good that is relatively scarce is known as an "economic good". Economists make a distinction between "Consumer's Goods" and "Producer's Goods". The former (which this paper is concerned with) are goods, which satisfy the consumer's wants directly.

Economists usually identify two main types of consumer's goods. First, are commodities (or 'products') and secondly, are services. Commodities and services are further classified as to whether they are necessities or luxuries. Commodities are also classified as to whether they are single-use or durable-use and whether they are perishable or non-perishable. Figure One depicts the usual classification of goods adopted by economists. It is based on the older, well-respected work of Hicks (1960). The most important property that distinguishes a commodity from a service is that the former is tangible whereas the latter is intangible. Motor Vehicles, spoons, VCR's and bread are tangible or material goods. Haircuts, train rides, massages and telephone calls are intangible goods.

The notion of single-use is that a commodity is used up in a single act of consumption (foodstuffs, fuel, matches and writing paper are examples). Durable-use commodities are those like furniture, motor vehicles, television and clothing can go on being "consumed" for an extended time period. The fact that they are "consumed" one day does not prevent them being "consumed" the next day and so on. The length of time they can be continually consumed however will vary from commodity to commodity. Each durable-use commodity will have a "normal" length of life before it "wears" out.

**Figure One: Types of Consumer Goods**



Another distinction often made by economists in relation to commodities is to whether they are perishable or are non-perishable. The distinguishing property that is relevant here is whether the commodity can be stored for a long period of time without serious deterioration. Durable-use commodities are usually non-perishable (and will be considered so for this paper), but not all single-use commodities are perishable (such as coal, which can be stored for a long period of time).

**CONSUMER GOODS AND THE INTERNET**

The "traditional" classification has proved to be a sound basis upon which to classify goods. When investigating whether such a classification is useful for determining suitable web site features with which to interact with consumers, one problem that immediately emerges is a "blurring" between the categories such as the advent of the Internet and digital goods. For example, one area where there is rapid change at the moment is in the area of music. When sold as a recording on a compact disc, it is a durable-use and a non-perishable commodity. When music is downloaded over the Internet, the good is now 'intangible' and therefore a service, but services are by definition single use! 'Downloaded' music can be played over and over again. An extended classification system is therefore needed in these cases.

**Classification Issues**

The Internet is seen by businesses as more suitable for their sales where the purchases are infrequent. This will generally apply more to non-perishable goods as opposed to perishable goods and to luxury goods than necessities. In the case of a non-perishable good, the consumer is afforded more time to be able to search the Internet for different options. In the case of a luxury good, the consumer is more likely to take more time to examine the available options in deciding whether the good will even be purchased at all. Commodities that are "bulky" (that is, difficult to deliver by traditional mail) or services where personal contact is critical (such as haircuts) are less suitable (or unsuitable) for delivery over the Internet. If a service is information-based, insurance, banking and shares for instance, transactions can be easily performed over the Internet. Among service-based organisations, those that currently receive orders via facsimile should see great potential in the Internet.

Table Two extends Table One to examine some practical examples. It matches the suitability of different levels of facilitation to a good's inherent characteristics. In applying the table to its own goods, an organisation would determine the characteristics of their goods and then work down the appropriate column to see how each level of facilitation would apply.

**Table 2: Levels of Sites, Internet Features and the Classification of Consumer Goods**

Classification of Goods:		Tangible Goods			Intangible Goods		
		Single Use		Durable Use	Single Use		Durable Use
		Perishable	Non Perishable		Perishable	Non Perishable	
Example:		Milk, Petrol	Disposable camera, Matches	Car, Cutlery	Share Price, Weather Reports	Gift Certificate	Software, Haircut
Comment:		Consumer likely to purchase regularly as needed - time is vital	Consumer more likely to 'surf' for various options	Consumer even more likely to 'surf' for various options	Consumer likely to purchase regularly - time vital, possibility for download	Consumer more likely to 'surf' for various options, possibility for download	Consumer more likely to 'surf' for various options, possibility for download
Level of Site	Internet Feature						
Electronic Broch	Product details	Possibly	Likely	Likely	Likely	Likely	Likely
	Information about the business	Possibly	Likely	Likely	Likely	Likely	Likely
	FAQ, product directions	Possibly	Likely	Likely	Likely	Likely	Likely
EB, Order	Ordering Capability	Unlikely	Possibly	Possibly	Possibly	Possibly	Likely
EB, Order, Pay	Payment Capability	Unlikely	Possibly	Possibly	Possibly	Possibly	Likely
Interactive Pub	Direct goods download	No	No	No	Possibly	Possibly	Possibly
	Gathering personal data	Possibly	Possibly	Possibly	Possibly	Possibly	Possibly
	Frequent Purchaser Incentives	Possibly	Unlikely	Unlikely	Possibly	Possibly	Unlikely

## **FURTHER OBSERVATIONS**

A number of important observations are derived from Table Two.

### **Implementation of Electronic Brochure Web Sites**

Most organisations that wish to interact with consumers can benefit in some way from introducing the basic electronic brochure web site. A quick examination of Table Two and any number of retail corporate web sites reveals this.

### **Can the Goods be Downloaded?**

In Table Two, the likelihood of intangible goods being downloaded over the Internet is listed as 'possibly', because not all services can be downloaded over the Internet. The main advantage of direct goods download is differentiation by time. The authors contend that this feature should not be introduced without also having online ordering and payment. What is the advantage that is gained by consumers from being able to directly download a good if they are delayed from getting the good by the process of placing the order or making the payment?

### **What is Convenient for the Consumer?**

In Table Two, the likelihood of Tangible, Single Use, Perishable goods being ordered and paid for over the Internet is listed as being 'unlikely'. This is because a consumer is likely to go out and purchase the goods without looking for alternatives. Where goods are Intangible, and Durable (a category introduced to extend the traditional classification), the likelihood of consumers ordering and paying for the goods over the Internet increases. For other categories, the attractiveness of ordering and paying over the Internet is differentiation by time. If a consumer needs to be present (at a retail store or otherwise) to receive and/or use the good, the attractiveness of immediate payment is significantly reduced.

### **Can the Good be Individually Customised?**

There are many ways in which a good can be customised to an individual. The level that a good can be personalised would influence whether an organisation would incorporate the (somewhat expensive) feature of gathering personal data about consumers on its web site. For instance, an online supermarket that sold milk as one of its goods could incorporate added value from such a feature. It could store away regular customers' standard orders and frequency of orders, making it easier for those customers to order, pay for and receive their weekly groceries. The gathering of personal data enables an organisation to build up a profile of the consumer.

### **Will Consumers be Purchasing Frequently?**

'Frequent purchaser incentives' are mainly targeted towards generating customers who will purchase from the organisation on a regular basis. The provision of frequent purchaser incentives is to provide consumers with the motivation to return to purchase more items. This is usually more effective where a consumer is likely to make regular purchases in a short time (more likely with single use items).



## **DEVELOPING THE INITIAL DECISION CHART**

An important component of the initial decision chart (refer Figure Two) is the decision process to be followed when organisations decide upon an appropriate level of web site facilitation.

### **Premises**

The initial decision chart is based on the following premises:

An extended version of economic theory concerning the properties of a consumer good is a sound basis upon which to commence the process.

Most organisations that wish to establish a web site would benefit from at least establishing a site with electronic brochure features as a minimum.

It is best to implement ordering and payment facilities where the good can be sent by mail, delivered or directly downloaded over the Internet.

There are some situations where it may be useful to implement an ordering facility without payment facility.

It is best to implement the feature of gathering personal data where the good can be customised in some way towards the individual.

It is best to implement a frequent purchaser incentive scheme with single use goods where the consumer is likely to order and purchase frequently over the internet.

### **Features of the Initial Decision Chart**

In the chart, the electronic brochure (EB) option is automatically included, as it would be adopted by most organisations that create a web site. The method of delivery is considered, as well as the extent to which the good can be 'personalised' to the individual consumer. The extent to which the good can be customised to the individual consumer is described at three levels: None, Some and Individual. The chart also takes into account situations where an organisation may implement an ordering facility without a payment facility.

The chart provides guidelines for an organisation to consider, serving the purpose of identifying that the feature **may** be useful. The organisation will need to decide if the particular feature is desirable. The organisation should also be aware that consumers may have different requirements. The chart operates by providing a classification scheme that firms can examine in relation to their goods. The 'classification path' that they follow leads to the suggested internet features. The internet features provide added value for the customer as explained in the examples that follow.

### **Application of the Initial Decision Chart**

The intended use of the initial decision chart can be illustrated with the following examples of consumer goods.

#### **Hairdresser**

The core business of a hairdresser cannot be carried out over the Internet. Usually, a haircut is given at a salon.

Assuming that the organisation wishes to have a web site presence, implement the Electronic Brochure. This would include information about the firm, the types of services offered and so forth.

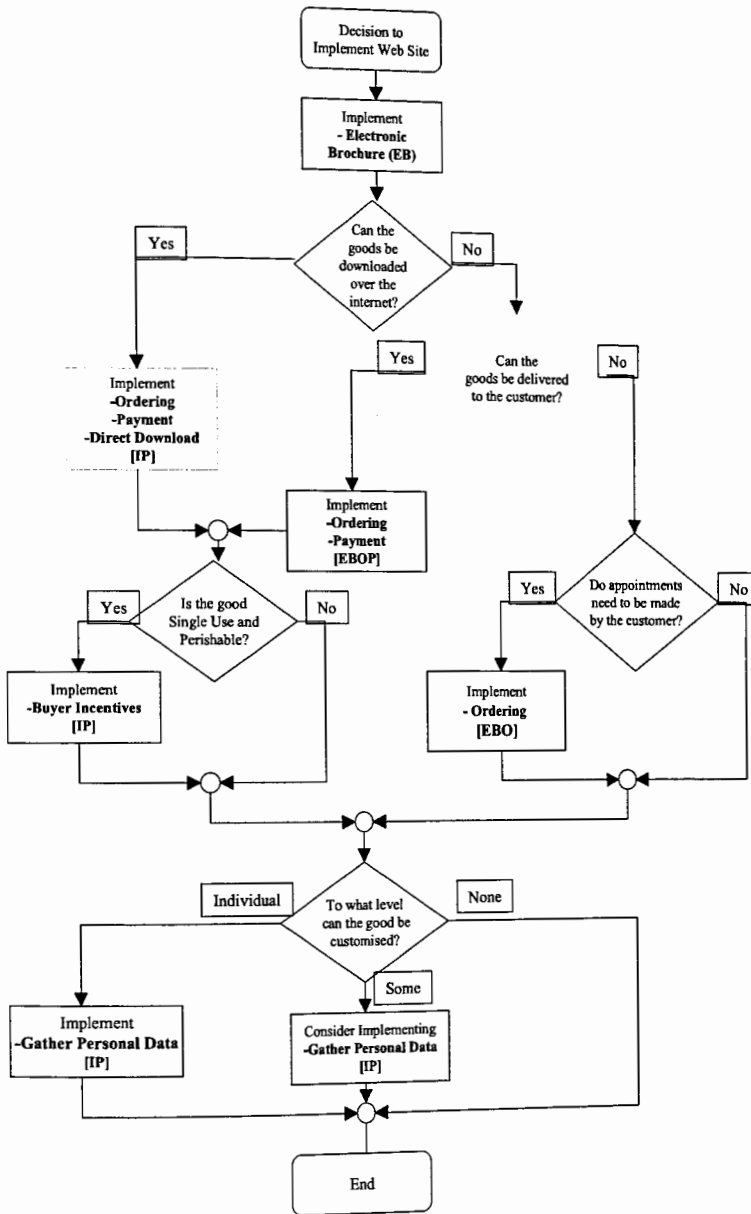
Can the goods be directly downloaded? No.

Can the goods be delivered to the customer? No (in our case).

Do appointments need to be made? Usually. In this instance, the organisation could consider implementing an Ordering facility. Will this provide a competitive edge relative to the cost? The firm would have to consider that.

To what level can the good be customised? To the Individual. The organisation may consider implementing Gathering Personal Data to record individual preferences for styling. They may even make available pictures of previous styles that the customer has had at the salon.

**Figure Two: Initial Decision Chart on the Use of the Internet to Add Value to Goods**



The business needs to assess whether these extra features would be worth the cost of implementing them. Do they have the types of customers that would take advantage of the extra features?

## Supermarket

In this instance the assumption is that the **service** provided by the supermarket is the gathering of a variety of goods (such as food and drinks) into a single location where the customer can gather them in one outing.

Implement Electronic Brochure.

Can the goods be directly downloaded? No.

Can the goods be delivered to the customer? Yes. Consider implementing Ordering and Purchasing. This would be expensive, but the value is provided for the customer that finds the trip to the supermarket an inconvenience. Some supermarkets that currently have an internet presence will deliver to home, work or other locations at a time specified by the customer. This strategy may attract new customers.

Is the good single use and perishable? Some will be and others will not be. The customer's order is likely to be modified (at least in some small way) each time an order is placed. Some of the items will be perishable and the customer will need a regular order to be filled. The organisation may consider a Frequent Purchaser Incentive Scheme to encourage customers to return repeatedly.

To what level can the good be customised? To the Individual. The organisation may Gather Personal Data to record customers' individual preferences so that the regular order can be easily modified by the customer, rather than having to re-enter the whole order.

For some customers a trip to the supermarket may also provide a chance for social interaction. These people would be unlikely to be interested in such a system.

## Clothing Manufacturer

The logic presented here could be used for a variety of clothing manufacturers that sell their goods through retail outlets.

Implement Electronic Brochure.

Can the goods be directly downloaded? No.

Can the goods be delivered to the customer? Yes. Consider implementing Ordering and Purchasing.

Is the good single use and perishable? No.

To what level can the good be customised? To the Individual. Consider using Gathering Personal Data to store individual sizes and style preferences.

## CONCLUSION

The decision chart presented in this paper should prove useful in assisting firms that wish to add value to their goods by using the Internet. It operates by providing a classification scheme that firms can examine in relation to their goods. The 'classification path' that they follow leads to the **suggested Internet features** which provide added value for the consumer. Practical examples of how the decision chart may be used for a variety of goods were presented.

The decision chart should prove useful because it identifies and links together a number of important determinants of how, and to what degree, the internet can be used to add value to a consumer good.

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# Key Knowledge Matrix – A Tool for Guiding an Intranet Based Knowledge Management System

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## ABSTRACT

*Knowledge management systems (KMS) centred around information technologies have to a large degree been ineffective in helping manage knowledge. KMS's have typically had top-down development methodologies which have proved organisationally and individually constrictive to be effective in the management of knowledge. They have also tended to focus on process rather than practice and have failed to deliver. The systems have also suffered as a result of "knowledge promiscuity" in that very little attention has been paid to what information and knowledge is core and hence warrants entrapment in the system.*

*A modern, media rich Intranet has great potential to overcome some of the problems of past KMS's. However, an eclectic, adaptive implementation and maintenance framework must be adopted to suit the individual knowledge needs of a particular organisation.*

*A review of knowledge management frameworks and implementation literature will be undertaken in this paper. Key determining factors for the effective management of knowledge will be identified from the literature. These factors will then be used to develop an overarching implementation framework. This meta-framework will be bottom-up in design and will drive the factors of an Intranet implementation from a knowledge-based perspective.*

*Keywords: Knowledge, Intranet, knowledge management, knowledge management framework*

## INTRODUCTION

Literature is indicating that there is movement toward a new form of economy often described as a knowledge economy. So companies and individuals who wish to remain successful might have to find ways of leveraging advantage in this new knowledge economy (Blumentritt & Johnston, 1999; Fryer, 1999; Kim & Mauborgne, 1999; Pitt & Clarke, 1999; Ruggles, 1998; Teece, 1998).

The movement of "knowledge" to centre stage is now creating new challenges for organisations. No longer is it just tangible products, processes, prices and people from which business profits, but also knowledge. The literature is becoming dotted with explanations as to what knowledge is (Collins, 1993), how to create it (Bajaria, 2000; Krogh, 1998) and how to manage or capture it (Brown & Duguid, 2000; Daniels, Axelsen, Tucek, & Sharma, 1999; Zack, 1999b). However, very few if any provide a suitable framework for the effective implementation of knowledge management and suitable supporting systems.

This paper will propose a framework that is intended for the knowledge management practitioner to effect a suitable, working, integrated system for the effective management of knowledge within an organisation using Intranet and its supporting technologies as the conduit.

## STRATEGY FIRST

Before we can start managing knowledge we have to have an understanding within our own context as to what knowledge is. Blumentritt & Johnston, (1999) state that "Knowledge requires the context of an intelligent medium". This intelligent medium of course is normally the organisation that processes this knowledge. Therefore, any attempt to manage knowledge should be tied closely to the organisation and its strategy due to its highly contextual nature. Zack, (1999a) makes the point that while many organisations can see the need to effectively manage knowledge, very few if any are effectively doing so and also seem to lack integration of knowledge management with the organisation's overall business strategy.

To separate knowledge management from the total organisational strategy, would be replicating many of the errors and faults found in the area of information management when it is treated in isolation from corporate and organisational strategy. The proposed framework suggests that knowledge strategy is the overriding or paramount feature and works with what the other necessary organisational components of the organisational strategy namely business drivers, organisational resources – including human and physical, technical and financial drivers must achieve in order to fulfil the knowledge strategy.

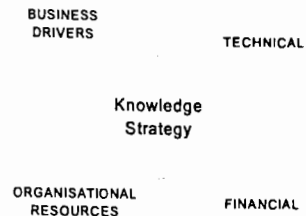


Figure 1: Knowledge Strategy as Key Driver

Due to the extensive use of the Strengths, Weaknesses, Opportunities and Threat (SWOT) analysis in information systems and other business areas (Zack, 1999a) uses a modified SWOT analysis to develop knowledge strategy. The SWOT analysis allows an organisation to identify opportunities for leveraging knowledge to produce and maintain competitive advantage. This technique would be used in this framework to identify the knowledge that the organisation sees as contributing to strategic and competitive advantage. Then having identified these opportunities some cleansing and classification will occur. This classification should occur with all of the key stakeholders involved in the production and use of the knowledge within the organisation.

(Zack, 1999a), having identified the key knowledge through the use of the SWOT, then classifies knowledge as either core, advanced, or innovative.

**Core** - the minimum knowledge required just play the game, does not provide sustainable advantage but does present basic barriers to entry.

**Advanced** - enables the firm to be competitively viable. Allows the knowledge to be differentiated even though the firm may contain the same core generic knowledge as other competing firms.

**Innovative** - is that knowledge that enables the firm to be leaders of industry and competitors and to allow significant differentiation from its competitors.

(Blumentritt & Johnston, 1999) creates a framework based around knowledge classified as codified, common, social and embodied.

**Codified knowledge** – is essentially equivalent to information and is readily transferable.

**Common Knowledge** – knowledge accepted as standard, learned through working in a particular context

**Social knowledge** – Deals with knowledge and relationships and cultural issues.

**Embodied knowledge** – tacit knowledge that a person has accumulated during their lifetime. Strongly connected to the individual.

For the purposes of this implementation framework I will adopt the Zack(1999) method of initially classifying data that is internal and external to the organisation. Extending the Zack(1999) framework, as in Figure 2, allows us to identify knowledge and attempt to determine its overall strategic value to the organisation.

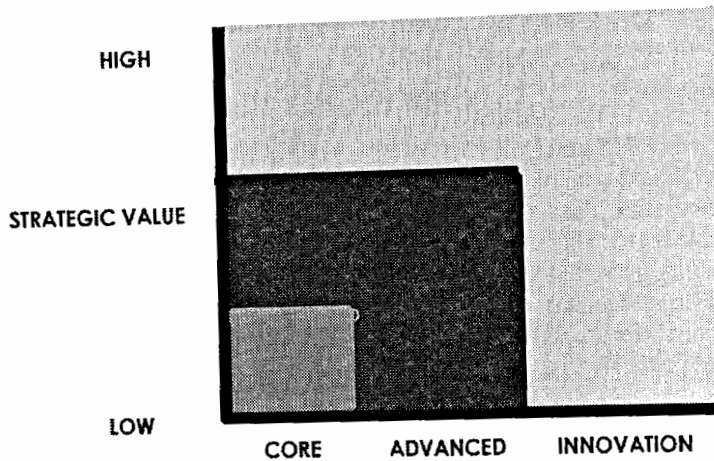


Figure 2: Strategic Value of Knowledge

The Next step is the application of the (Blumentritt & Johnston, 1999) methods of classifying knowledge to further filter the knowledge types within an organisation. This would result in the ability to produce a matrix of knowledge views which I will term the Key Knowledge Matrix (KKM) based on the identified knowledge types according to the (Zack, 1999a) and (Blumentritt & Johnston, 1999) frameworks. An example is given in Table 1 below of a Pizza shop processing an order for a pizza

Knowledge	Strategic Value	Zack	Blumentritt
How to use the phone system	Low	Core	Codified
How to effectively cook a pizza using the "special oven"	Low	Advanced	Common Knowledge
The recipe for the secret sauce	High	Innovation	Embodied

Table 1: Sample Key Knowledge Matrix

This production of a Key Knowledge Matrix (KKM) using the above table as a the guide should then allow us along with the identified knowledge strategy to select viable and codifiable knowledge to entrap, encode and express in our knowledge management system. By attempting to classify each particular item according to the three examining frameworks it should allow for extensive examination of the attributes and potential worth of that knowledge to the organisation.

Not all knowledge is codifiable or collectable, as it is tacit in nature and therefore often difficult to codify (Zack, 1999b). It is also sometimes desirable that knowledge should not be codified as its increased ability to be readily transmitted and transferred to third parties could diminish any strategic competitive advantage that is gained by possession of that knowledge.

The KKM allows an organisation to use several lenses to view and classify key knowledge within the organisation and make a balanced judgement based on determinants other than its potential for simple codification. The KKM also identifies knowledge areas that need development and growth to further benefit the organisation for instance to take a knowledge item and move it from being low strategic, innovative value to one

that is his in strategic value and innovative. The KKM should become a focal point and de-facto mechanism that refines, reviews and validates the knowledge for the organisation as a whole (Brown & Duguid, 2000; McDermott, 1999) through this process of balance and eclectic view.

One of the other ideas behind this framework is to avoid "knowledge promiscuity" that exists in other knowledge management systems and frameworks. Knowledge promiscuity is best described as the indiscriminate collection of information for no other reason other than it may be of some value, someday, somehow, somewhere. (Brown & Duguid, 2000) see the need for a process of refinement:

"Yet even when individuals fill databases with their own ideas of what's useful, they aren't much help either. Often what one person thinks useful others find flaky, idiosyncratic, incoherent, redundant, or just plain stupid. The more a database contains everyone's favorite idea, the more unusable it becomes."

By classifying, cleansing and gathering knowledge that is aligned and relevant to achieving the outcomes of the overall knowledge strategy the organisation is effectively scouring the knowledge mines and making the knowledge nuggets filter through.

## **SYSTEM OPENNESS – KNOWLEDGE OPENNESS**

Information technology has long been seen as the transforming "silver bullet" (Lynne & Marcus, 1997) and appears to have had the same affectations when used for knowledge management (McDermott, 1999). This could largely be due to the fact that the systems that were predominantly used lacked anything more than digitisation of the written word and were essentially textual in nature. A modern, media rich Intranet that uses open connectivity and application standards plus a variety of media formats should enable a wider codification and entrapment of knowledge. This has not been possible with traditional information systems and architectures due to their often closed and proprietary nature.

Knowledge that was hard to codify using traditional written text and database systems can now be encoded using technologies such as streaming sound and video. This enables a modern Intranet to store information that is more tacit and contextual in nature than with conventional text based systems (Roberts, 2000). For example the procedure to assemble a particular organisational artefact can be readily demonstrated using a video-based approach. But the same codification using text-based systems is nearly impossible to codify and could be prohibitively expensive in terms of actual production costs.

Also the translation from what actually should physically occur such as colour, tone, smell etc into text or language often results in a loss of the tacitness – e.g. nuance and richness associated with it. The use of media rich technologies such as video and streaming audio can go some way in alleviating some of these problems. For example when tempering tool steel, the steel has to be heated to what is termed a cherry red colour. Simple enough, but as everyone's concept of cherry red can be different would this knowledge not be better transferred through the use of video or still colour images than the simple text description cherry red.

The use of an Intranet offers a wide range of tools and communication media. If properly deployed an Intranet can enable a seamless integration with legacy systems which (Davenport, DeLong, & Beers, 1998) highlighted as a success factor in knowledge management systems. These systems should also be common and pervasive for computation and communication (Davenport et al., 1998) within the organisation. In the case of modern networked desktop PC, whose most popular operating system is Microsoft Windows which contains a bundled Internet Web Browser as part of the software, the web browser is about as pervasive as it gets.

## **MATCHING THE MATRIX TO THE MEDIUM**

Having produced the Key Knowledge Matrix (KKM) the next step is to match the KKM with appropriate supporting technologies for the codification of this knowledge. Where possible, as many ways of codifying and storing this information as is practicable should be undertaken. (Davenport et al., 1998) states "Successful knowledge managers recognise that knowledge is transferred through multiple channels that reinforce one another". People acquire and process information and knowledge in a variety of ways and have a variety of learning orientations and cognitive styles. This diversity of learning and cognitive styles is recognised by offering the information and knowledge in as many different signal forms as possible. By offering the knowledge



and information in a variety of ways in a modern, media rich Intranet the chance of effective transference of knowledge should correspondingly improve.

By offering a multitude of knowledge and learning options you are also catering for the many levels of understanding and skill that would exist within an organisational context. For example something that may seem simple and routine to one highly skilled person may be highly difficult for one lesser skilled or novice person within the organisation to accomplish. Hence as a result a higher skilled person may simply need to read a FAQ posting to extract the required knowledge, whereas the novice may require higher detail and possibly be aided by the use of say an on-line video demonstration of the technique.

Identification, codification and storage of knowledge are vital parts of a knowledge management system but equally important is a review and retirement schedule. Knowledge eventually dates and either needs review or retirement from the knowledge base – in the same way that a traditional librarian culls a collection the same principles must be applied to a knowledge management system. Knowledge codified and stored should have a review procedure built-in to remove redundant or irrelevant data.

### **Organisational aspects of the Matrix**

The need for project champions is well documented throughout the regular IS literature (Beath, 1991; Edwards, 1996; Pinto & Slevin, 1989) and appears in some of the knowledge management literature (Davenport et al., 1998). For any knowledge management system to survive there must be a driving junta or at least knowledge knight. The introduction of a knowledge management system has far reaching organisational aspects that affect how people work and share knowledge and for a lot of organisational contexts knowledge redistribution can produce some quirky behaviours (Brown, 1994; Davenport, Eccles, & Prusak, 1992; Pfeffer, 1981). Hence the need for the “project champion” and at least recognition from the organisational hierarchy.

Where possible some of these effects should be identified through an internal SWOT analysis and be documented. The experiences (Robey, 1979; Robey, Smith, & Vijaysarathy, 1993; Szajna & Scamell, 1993) gained from implementation of systems indicate the need to maintain a positive, proactive posture to maximise project success. Proceeding formal documentation the results of the SWOT should be analysed and procedures and policies taken to maximise positive outcomes and minimise the potential negative effects.

A lot of previous knowledge management systems have suffered from a top down, regimented, non-consultative approach. The KMM is designed to be a consultative tool that also draws from existing communities of practice (Storck & Hill, 2000; Wenger & Snyder, 2000) within an organisation. This allows the key users of the knowledge to be part of the knowledge arbitrage as it were and should lead to knowledge that is selected to be at least relevant and required (Brown & Duguid, 2000).

### **Financial implications**

There is little point in pursuing a knowledge management strategy when there is no financial backing of the project beyond the initial project. This framework is not concerned overly with benefits realisation, or other benefits measures methodologies and techniques. It is primarily involved with the ability of an organisation to sustain the knowledge management strategy.

Implementation of the knowledge management strategy may require the acquisition and usage of extra resources beyond what an organisation already utilises in their day-to-day operations. These sorts of resources include physical goods such as servers, hardware and software and the often forgotten human resource. A solid financial model and sound analysis of these financial requirements should be undertaken before the decision is made to move to implement the knowledge management system.

Many of the financial measures will be salaries, wages and equipment and the “figures” alone will seem to be revenue negative. However, for a balanced financial picture some cost benefit analysis and evaluation of intangible benefits and opportunity costs of not pursuing the strategy should be included in the analysis.

There may be some flow on effects from the organisational implementation SWOT in terms of rewards for organisation members.

## Business Drivers

The need to move to a notion of knowledge based business is quite simply one of remaining competitive in the evolving information or knowledge economy (Blumentritt & Johnston, 1999; Fryer, 1999; Kim & Mauborgne, 1999; Pitt & Clarke, 1999; Ruggles, 1998; Teece, 1998). However, the type of business to a large degree will also determine the strength and completeness of the knowledge strategy needed. If your business is simply the manufacture of a generic raw product or provision of a generic labour or service then the amount of knowledge management required will differ from that of a leading edge or entropic profession such as IT. For example we will use the building of brick wall i.e bricklaying principles to a large degree have not changed much from the time of the Pharaoh's – however the engineering, architecture and underlying skills and technologies associated with brick laying have.

Business drivers and market forces will also affect to a large degree the “worth” of your knowledge and it is important that the (Zack, 1999a) use of the SWOT scan of the external and internal environments be used. A recent example is the Y2K phenomenon, COBOL was long buried as a computer language then along came Y2K and the value of that knowledge dramatically increased prior to Y2K rollover. But now once again the dust would be settling on that COBOL code manual.

Knowledge like most things degrades as a result of business changes. This resultant degradation changes the strategic value of the knowledge in that it progress from being Innovative to Core knowledge and as such will take on a higher operational importance within the business.

## THREADING IT ALL TOGETHER

The previous parts of the paper addressed some of the key issues and concepts that the Key Knowledge Matrix (KKM) should address using the Intranet as the delivery tool. The implementation of the KKM is seen as an interactive and iterative process that is constantly evolving.

The following is an outline for the KKM implementation process

**Knowledge SWOT** – this involves the use of a SWOT of the external and internal knowledge sources to try and determine the types of knowledge that the organisation processes.

**Knowledge Classification** – this involves the use of the KKM to classify the indemnified knowledge that is used within your organisational context. This matrix should be used as a tool that provides a multi-view framework for the identification of key knowledge assets and deficiencies within the organisation. The matrix should be used as a consultative tool led by project champions that involve existing communities of practice and practitioners within the organisational context.

**Matrix and Media** – this is where identified knowledge sources are matched with appropriate mediums for effective delivery. This should be across a wide range of alternatives utilising appropriate Intranet technologies such as text, audio, video, graphics, interactive chat, integration with legacy systems, etc.

**Organisational Oversight** – identification of organisational impacts of the new knowledge strategy should be taken into account. The possible effects and benefits should be mapped and identified as much as practicable in an effort to maximise benefits and minimise downside.

**Financial Focus** – having identified the knowledge and the method of delivery financial feasibility has to be determined. This is done by adequately resourcing the initiative and the full production of cost and delivery schedule. Incorporation of benefits management will be largely determined by the organisational focus. Due to the ubiquitous nature of knowledge as a resource intangible benefits will have to be balanced off against hard financial measures to justify the financial investment.

**Deployment** – Assuming that there is general agreement to go ahead then deployment should occur.

After an appropriate amount of time, depending on the complexity of the whole deployment process, the KKM should be revisited, re-evaluated, redefined and redeployed. This is to ensure that the overarching knowledge strategy is aligned with strategic business direction and key strategic drivers for the organisation. By doing this you should lessen the chance of strategic drift from a business and knowledge perspective.

## CONCLUSION AND FUTURE DIRECTIONS

By using an iterative, consultative process based around the eclectic Key Knowledge Matrix (KKM) that promotes the active identification of what types of knowledge an organisation possesses, requires and retires it is hoped that effective knowledge management will start to occur. To promote one singular view of knowledge, its structure, its interpretation and its implementation as the “right one” is simplistic and evokes visions of Lang’s Metropolis, Orwell’s 1984 or Huxley’s – Brave New World. People acquire, store, retrieve and process knowledge and information in varied ways and as such the knowledge management strategy and a resultant system should be reflective of this.

The outlined process and KKM outline here is going to be piloted as part of an action research project in an organisation of 12 staff that is the communications and knowledge hub for its some 6500 members. They currently have no formal knowledge strategy, Intranet implementation or system other than traditional documentation and filing repositories which they readily admit need major revision and review. They have large amounts of explicit and tacit information that need effective management from internal and external perspectives. This will hopefully deliver some invaluable feedback on knowledge management strategy and the role that a modern Intranet can play in effecting one.

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# Authentic Assessment for Multimedia-Centric e-Business

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## ABSTRACT

*This paper outlines the rationale and course design strategy used for creating an E- Business Planning course, developed for final year multimedia students, who have no previous instruction in business planning concepts. The pedagogical underpinnings of the course is based on authentic assessment, which is used to promote motivation and interest for a group of students who have no real interest in business and costing principles.*

*This is the third evolutionary development of the unit. The revised design criteria for the unit outline now reflect the pedagogy needed to satisfy the changing requirements demanded by multimedia-centric e-business, as promoted by industry and government.*

*Keywords: Electronic Commerce, Authentic Assessment, Higher Education*

## INTRODUCTION

"As we enter the third millennium we experience one of the most important changes in our lives – the move to an Internet-based society. Almost everything will be changed at home, in school, at work, in the government-even in our leisure activities. Some changes are already here and they are spreading around the globe. Others are just beginning. One of the most significant changes is in the manner we conduct business especially in how we manage the marketplace and commerce."

As reflected by Turban et al. (2000), the exponential increase of Internet usage is demanding that businesses update their skills and re-engineer their products and services to meet new competitive demands in both local and global markets. Training is needed to support these changes that require equipping a wide range of business operators with new skills in business planning and information literacy. However, these demands are raising critical issues for educators. What disciplines should offer these courses – computer science, multimedia, business, engineering, others? What teaching and learning strategies should be used to motivate students to learn content which is "outside" their discipline area eg computer science students learning about business planning? How can tertiary institutions keep these courses up-to-date with technology and business needs?

In Australia, the government is actively trying to promote the uptake of E-commerce business planning. The Department of Communications, Information Technology and Arts (1999) has identified that the Federal government must target existing barriers for the development of E-commerce and promote the integration of E-commerce into business. Otherwise, business and the economy at large will suffer long-term consequences. This is supported by the Department of Industry and Tourism (1998), who contend that E-commerce has the potential to transform the economy more rapidly than the industrial revolution! These predictions and impending changes have serious training ramifications. How can large numbers of business operators be quickly trained in on-line technology? How can E-commerce strategies be quickly implemented by business to take advantage of this new revolution?

In order to meet these changes in a *timely* manner, training and skilling of both the existing work force, and of new students entering the business environment is required. University courses spanning over three years duration will not provide the body of knowledge or skills needed by Australian business to compete in this rapidly changing marketplace. Graduating students need timely courses to bring them up-to-date with changes in technology and provide them with skills to manage electronic commerce, business practices and online marketing processes. Training and development courses also need to provide ongoing collaboration and mentoring with industry to ensure the knowledge acquired is current and relevant (Mitchell, 2000).

## CONTEXT & BACKGROUND

The unit IMM 3329/4329 "Multimedia Business Solutions" is a final year, final semester unit taken by both under and post-graduate students in the Multimedia course at Edith Cowan University. The unit is intended to develop student expertise and knowledge about E-commerce business planning, and how students can effectively use this knowledge to create more business centred web sites.

In September 1999, a group of ninety, second year multimedia degree students from Edith Cowan University completed a two-week intensive E-commerce business-planning course. They had no previous instruction in business planning and minimal understanding of E-commerce issues. Participants were required to develop an E-commerce business plan, which could be sustained economically by a business to sell products in an on-line environment. The course was subsidised by the Office of Information and Communications (OIC), which is part of the Department of Commerce of Trade, a Government department in Western Australia. Dow Digital (an E-commerce and on-line services consultancy and development company) developed the course and was subsidised to run it at Edith Cowan with a view of evaluating its effectiveness for university graduates in Australia, as well as how it could be implemented in third world countries. A questionnaire was designed to elicit student and industry views on the value of the course (Luca & McLoughlin, 2000). From feedback gained from this study, a number of conclusions were made:

- a two week intensive course was too short;
- the course is better suited to final year, final semester students;
- teams should be involved in developing more authentic business plans;
- team size should be no greater than four; and
- students needed more help on creating budgets using spreadsheets.

On the basis of this feedback, a full semester course was developed and implemented for final year, final semester multimedia students. At the end of this course (Semester 2, 2000), students were interviewed and questionnaires given to all participants in an attempt to evaluate the course. There was unanimous agreement that the course provided information and ideas that would help them gain employment, and also generate ideas for their own businesses. The main criticism of course was focused on the lack of support for business-planning and accounting concepts coached in authentic or "real" activities.

## AUTHENTIC ASSESSMENT

Authentic activities based on constructivist principles are essentially real contexts and situations that promote problem solving and higher order thinking skills. Authentic activities are real world tasks that provide students with opportunities to develop the knowledge and skills needed for specific contexts, even specific jobs and roles, Barab et al. (2000a). Land & Hannafin (2000, p. 13) explain that "...learning occurs naturally as a consequence of the learner recognizing knowledge's practical utility as well as the need to use it in an attempt to interpret, analyse, and solve real-world problems."

Immersing students in real world contexts such as authentic tasks promotes the development of work place readiness skills. Students expect more from their university courses than in the past. These expectations include developing real skills and knowledge that can help them gain employment in the industry of their choice. The course they choose at university is essentially the vehicle that will enable them to gain employment. Students also expect that what they actually learn at university reflects the real world. The real world being the knowledge and skills gained at university reflects the expectations of employers and provides students with highly specific industry skills. Truly authentic activities enable students to gain the necessary employable attributes and the ability to transfer their learning to real world problems. Traditional pedagogy generally only provides students with isolated concepts delivered by didactic teaching practices. In traditional pedagogy, learning activities are not based on immersing the content into an authentic real world context, but rely upon direct delivery methods such as lectures to impart content knowledge, which is generally isolated from reality.

What may be an authentic activity to one student may not necessarily be authentic to another. Petraglia (1998) explains that "the task of balancing a cheque book, for instance, may be an authentic task from the perspective of a 21-year-old but we would question its authenticity from the perspective of a 5-year-old. But more to the point, even among 21-year-olds, for whom we believe the task should be authentic, there are some who will find any given lesson in personal finance irrelevant, inaccurate, or otherwise inappropriate."

The effectiveness of authentic activities, whether they are learning designs such as problem-based learning, case-based learning, inquiry-based learning or project-based learning environments depends upon the motivation, student engagement in the activity and successful delivery. Teachers may consider just the use of any of the above learning designs as essentially authentic but the context and relevant of the activity, especially to the students, determines its authenticity. The student may not necessarily perceive the teacher's perception of authenticity in the same way and what the student perceives to be authentic may not be authentic to the teacher (Petraglia, 1998, Barab & Duffy, 2000a).

Barab et al. (2000b) support this by explaining that authenticity relies on learners perceptions of the practicality of the learning environment they are immersed in and their perceived value of these activities relative to their goals and the real-world. Learner's perceptions of the real world are crucial in determining the relevance and therefore the authenticity of the learning task. Authenticity is then reliant on the dynamic interactions among the various components of learning environment – the task, the learner and the expert.

For students to be able to cope with authentic activities it is necessary that they have developed essential knowledge and skills that they can apply to the activity and which forms a basis upon which they can build additional higher order skills whilst immersed in a real life context. Perreault (1999) explains that novices can still be given authentic activities but the activities can be limited to exercises and discussions that used realistic examples. Using realistic examples during student's development of basic essential knowledge and skills helps them become aware of realistic applications of their knowledge. Petraglia (1998) believes that the essential element for the success of authentic activities is the relevance to the learner. Engaging and stimulating student interest is essentially the importance and attractiveness of the motivational strength of authentic activities. Authentic activities are only a powerful engager if students deem that the activity holds relevance and provides knowledge and transferable skills to help in the pursuit of employment and career opportunities.



If students are motivated to gain as many employable skills and the knowledge to be competitive in the job market then authentic activities would be an effective pedagogy to be adopted for this particular university unit - IMM 3329/4329 Multimedia Business Solutions. The focus of the unit is to provide students with real life opportunities to develop expertise and knowledge in e-commerce business planning to effectively produce functional business web sites for real clients.

In design learning activities for the unit a fundamental question was asked - How and what types of learning activities do we create that will motivate students who are not really interested in business and accounting type concepts? Essentially students enrolled in this unit are multimedia majors who are mainly interested in creating effective multimedia, as individuals and in cooperative and collaborative teams. Business and accounting concepts were generally not considered by students as part of the knowledge and skills they would need to find employment in multimedia. Providing students with authentic activity that immerses them in designing e-commerce web sites and developing effective business plans within a project-based learning design was seen as a solution. Teaching students costing concepts and how to prepare a business plan were seen as the necessary scaffolding they would need to effectively immerse them in the project and to help them see the relevance of these concepts to the real world of e-commerce. Teaching of these concepts and skills, in the context of an authentic project would provide a real context to the concepts, which generally are taught using traditional didactic pedagogy. Students would then be able to see the relevance of these costing concepts and business planning, in meeting the needs of their real clients.

Essentially we felt project-based learning would provide an environment that would engage students in the process of designing and creating e-commerce business plans to meet client needs. Project-based learning lends itself to cooperative learning, enabling students to discuss, explore and test ideas/concepts supported by a team environment. Project-based learning environments are considered authentic in nature and provide a learning environment that stimulates and encourages students to construct their own knowledge and pursue their own interests resulting in the creation of realistic products (Moursand, 1998).

Characteristics of project-based learning include (<http://guzdial.cc.gatech.edu/repp/draft.html>):

**Integrative** - project-based learning draws upon a variety of knowledge and skills and does not necessarily focus solely on a particular limited piece of content.

**Authentic** - project-based learning is an authentic activity that can relate to a real context and in this case real clients.

**Product and Process** - project-based learning requires students to apply their own investigative, planning, designing, evaluation and production strategies to successfully satisfy their interests and create a real product.

**Collaborative and co-operative** – students work in teams calling on a number of skills including negotiation, communication and social skills.

Using an authentic activity such as project-based learning enables us to incorporate all of the essential components of an integrated, real life client focussed task.

## **COURSE DESIGN OVERVIEW**

How best to implement courses like these to promote motivation for students who are not really interested in business and accounting type concepts, is not an unusual question to ask in the changing world of multi-skilling and cross-skilling needed today. This generic problem of an educational need that does not "fit in the box" requires four important facets to be addressed by the university teaching and learning planners, when looking at Multimedia e-Business Solutions:

A pedagogical framework and learning design that achieves a high level of motivation of the students.

An authentic assessment using real-life examples and assignments, and dynamic interaction with industry practitioners.

An emphasis on digging for good feedback and solid facts derived from quantitative web metrics.

An understanding of the need for integration of the front-end web design with, for example, ERPs and CRMs, and all the other components of e-business.

A good IT project manager, does not need to be a top-gun programmer, but does need to have a respectable overview of the spectrum of disciplines that make up the intellectual horsepower of his IT project team. In the same way, a successful multimedia graduate needs to be not only aware of the changes in multimedia-centric business technology, but also be provided with skills to manage electronic commerce, business practices and

online marketing processes, without necessarily being a certified practising accountant. The model we shall be using in semester 2, 2001 is based on the following course design criteria:

Each weekly lecture includes a real world business case that provides an authentic exemplar of the aspect of e-business covered in the lecture material;

A discussion session at the end of each lecture reviews whether the relevant e-business issues were resolved in the real world business case presented, and importantly, how those issues were resolved in that business case;

Each weekly lecture is followed by a 2 hour laboratory tutorial, tutored by full time e-business professionals from industry;

The laboratory tutorial exercises utilise real world e-business examples specifically selected to illustrate key concepts, and in particular, to illustrate the processes (as per Napier et al, 2001) involved with planning, starting, and marketing a new e-business;

The weekly lectures include contextual guest lectures from visiting industry professionals;

The lecture and laboratory series include supplementary and optional case studies to challenge and motivate the students into widening their on-line research activities;

The learning outcomes include specific goals such as:

understanding different e-business models (Kalakota & Robinson, 2001);

exploiting e-business opportunities (Plant, 2000);

developing an e-business plan (Napier et al, 2001);

developing guidelines for an e-business start up (Napier et al, 2001);

understanding management issues such as HR, operating and capital costs of the business (Plant, 2000);

identifying risk management and security issues in e-business (Kalakota & Robinson, 2001);

understanding the importance of web design and the associated costs (Buytendijk & Janowski, 2001); and

integrating the web site "front end" to the enterprise "back end" planning eg ERPs, CRMs, purchasing, invoicing, and credit and debit control issues (Napier et al, 2001).

The students to work in project teams of 4 to produce a real business plan for a real client, as a project for formal presentation to industry in a competitive environment with MIS students and themselves, towards the end of the semester;

Presentation night will have a few hundred people. This event will be facilitated by a \$10,000 grant from the Department of Commerce of Trade to promote the competition;

10 teams will be selected for the final presentations from about 35 teams (20 teams from Multimedia Business Solutions and approximately 15 teams from Management Information Systems);

Sponsors have been selected to give the project team with the best e-business plan a prize;

This set of course design criteria will provide an authentic assessment environment for e-business planning for a multimedia business solution.

## CONCLUSION

The move towards on-line commerce, entertainment and education is spreading rapidly with a decreasing supply of skilled operators who understand the business and technological aspects of this new paradigm. Government, industry and educational institutions must work together to keep up with these changes and add value to courses, in which final year students will be motivated to achieve through authentic learning designs and assessment.

At Edith Cowan University, we have adopted these principles to create an authentic learning environment that meets the needs of students, industry, and government. The unit outline developed includes learning outcomes that reflect this strategy by incorporating real world activities with an e-business planning focus. A successful multimedia graduate will be not only be aware of the changes in multimedia-centric business technology, but also be provided with skills to manage electronic commerce, business practices and online marketing processes, without necessarily being a certified practising accountant.

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# The Design, Development and Implementation of An E-commerce System for Procuring Materials In Construction

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## ABSTRACT

*This paper presents an E-commerce system that is being used for construction material procurement. The paper identifies the limitations relating to information retrieving, recording and sharing in the traditional material procurement process. E-commerce applications that can improve the efficiency and effectiveness of the material procurement process in construction are then identified and described. Finally, the design and implementation of an E-commerce system for construction material procurement for trading construction materials in China is presented and discussed.*

*Keywords: E-commerce, Web, electronic catalog, bidding system, material procurement*

## INTRODUCTION

The value of materials that are required to be purchased and used for any construction contract make up a large proportion of a project's total contract sum. Typically, materials account for 40% to 45% of the cost of all construction work (Andrew *et al.*, 1998). Maintaining an efficient and effective material procurement system as well as procuring materials at the right price, quality and time are essential for contractors remain competitive in today's environment. The emergence of Internet technology has enabled information to be shared and exchanged through a common global network in an efficient and relatively low cost environment. Many companies are now conducting their business using a Web-based E-commerce system. In fact, it has been suggested that E-commerce can provide a win-win situation for both suppliers and buyers, as E-commerce can provide an expanded marketplace within which buyers and suppliers can communicate directly with each other (Cheng *et al.*, 2001). Online construction trading markets are not limited by the physical limitations of store spaces and can carry a much larger variety of products, which can range in style and size. At the same time, buyers can search through a wide range of products with low transaction costs at any time convenient to them. More importantly, direct communication between buyers and suppliers will eliminate the multiple middlemen that often exist between suppliers and buyers. Consequently, products can be purchased at lower prices and delivered quicker to the purchaser (Bakos, 1991).

This paper presents an E-commerce system that is being used for construction material procurement. The paper identifies some problems relating to information retrieval, recording and sharing in the traditional material procurement process. E-commerce applications that can improve the efficiency and effectiveness of the material procurement process in construction are then identified and described. Finally, the design and implementation of an E-commerce system for construction material procurement for trading construction materials in China is presented and discussed.

## THE TRADITIONAL CONSTRUCTION MATERIAL PROCUREMENT PROCESS

In a traditional contractual environment, the contractors' procurement of materials commences at the tender stage when the design of the project is finished. The main concerns of material procurement are the provision of the right materials at the right time, in the right place and to an agreed budget such that progress on site is uninterrupted (Canter, 1993). Figure 1 depicts the activities and their sequence in a typical material procurement process. After receiving the tender documents, contractors invariably start estimating and send out enquires to their selected suppliers. When quotes are received from suppliers, contractors will select the best quotes and complete the tender documents. If contract is awarded in the later stage, the purchasing function will re-confirm the validity of the supplier's original quote or negotiate a revised price for materials. Once a suitable supplier has been selected, the next step in the purchasing process is to raise and issue a purchase order to the supplier, which will constitute a legal contract when the supplier accepts or acknowledges receipt of the order. In effect the order becomes a written commitment to accept and pay for goods under an agreed set of terms and conditions. Orders will be tracked until materials are received and checked on site.

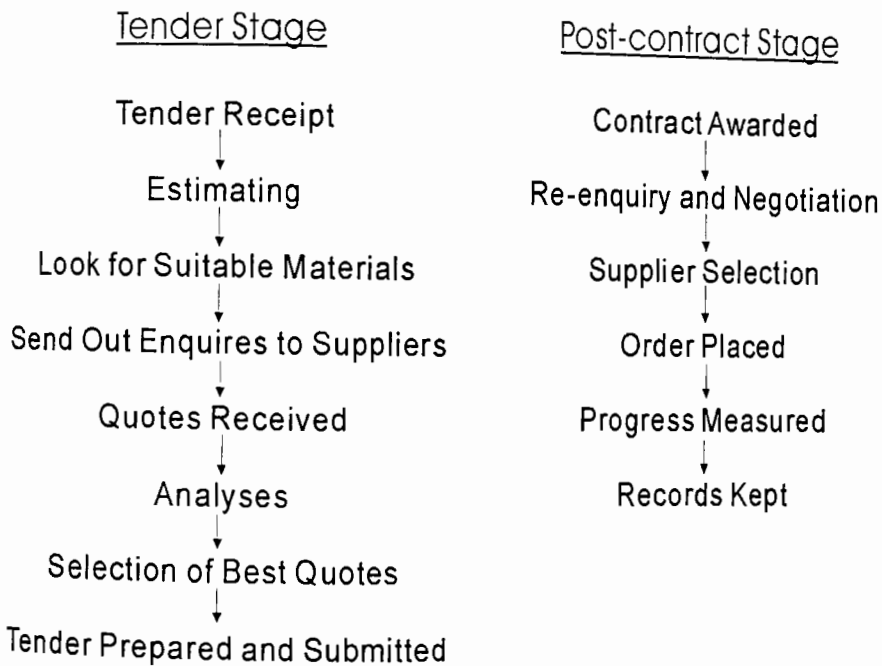


Figure 1: Typical material purchasing sequence

## Information Flow in the Material Procurement Process

From the requisition of quotations at the tender stage to the actual receipt of materials and signing invoices, different paper-based documents are produced, copied, passed and referenced by different groups of participants in the traditional material procurement process. During the tender stage the estimating teams of contractors obtain construction materials information from physical catalogs of suppliers. Based on these catalogs they compare and select suppliers and send enquiries to and receive quotations from the selected suppliers. Figure 2 shows a typical paper-based document system of a purchasing function during the post-contract stage of a project (Calvert, 1995). In this paper-based document system, the site office prepares two copies for the requisition of materials. One copy is sent to the buying department and one copy is filed. The buying department then prepares four copies of the purchase order. One copy is sent to the selected supplier and the site office, the accounts department and the buying department keep the remaining copies for their records. The site office will receive an advice note and invoice issued by the supplier when materials arrive on site. The invoice will be compared with the purchase order by the buying department and after confirmation, be passed to the accounts department to issue payment.

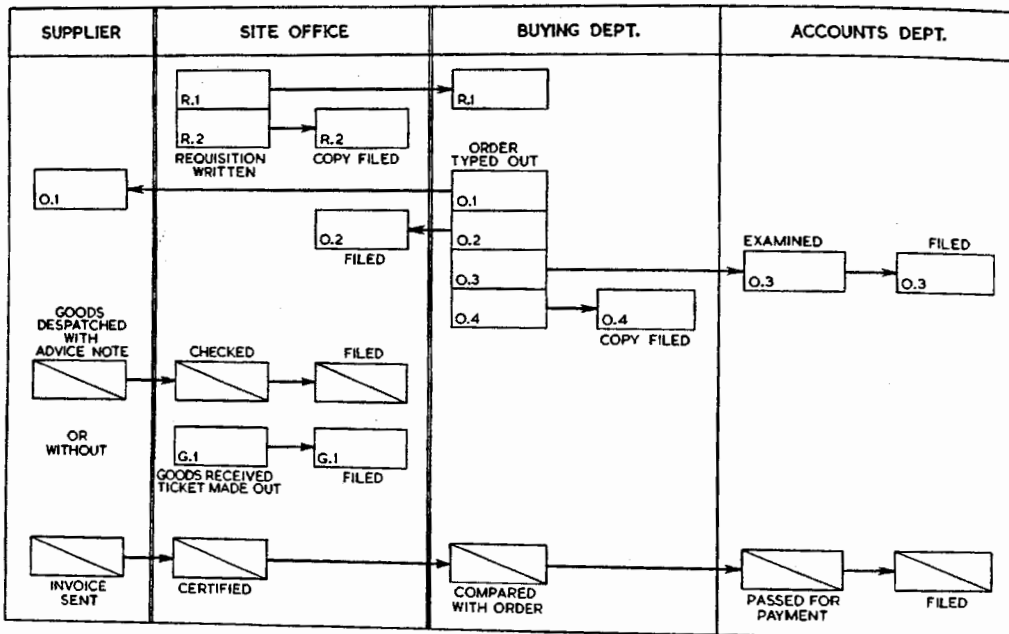


Figure 2: Paperwork required in the purchasing system

## Limitations of Traditional Material Procurement Process

It is proffered that the traditional material procurement process has the following limitations. First, this process has specific business hours and can only work with suppliers within a defined geographical region. In addition, the traditional process can only collect limited amount of information about the suppliers and their products through the collection of physical catalogs. Physical catalogs are cumbersome to use, and require large storage areas. They also become dated very quickly, and make searching and comparison of prices and quality a nebulous task. These disadvantages make it increasingly difficult for contractors to stay abreast of market conditions and thus select the most suitable materials and suppliers for a given project. Additionally, the paper-based transaction system that is commonly used within the realm of the traditional process of material procurement is time-consuming (and thus non-value adding). As mentioned above, copies of different documents are produced manually and are used by different parties in the material procurement process. The probability of error increases as information is transcribed from one document to another. Although paper documents can be re-typed into a computer-based environment, data entry of document

information requires multiple transcriptions of the information. Consequently, such process can result in the introduction of additional errors to the system. Furthermore, the paper-based system is also dependent on ensuring that all appropriate departments obtain copies of the documents necessary to do their job. If a small percentage of those documents are lost or misplaced, there can be gaps in the system and orders may go unfulfilled.

## E-COMMERCE APPLICATIONS

E-commerce refers to business activities involving consumers, manufacturers, service providers, and intermediaries using computer network. Electronic data interchange (EDI) has been used to forge automated linkages between the buyers and suppliers to transmit orders, receipts, and payments electronically. Studies have shown that using EDI for linking with so called 'channel partners' can help reduce processing, cycle-time, improve accuracy, and create strategic value (Mukhopadhyay, 1998). However, EDI requires the support of private lines or value-adding networks (VANs) and relies on software that can incorporate varying formats, which limits its coverage. Moreover, EDI requires significant investment to facilitate trading among business partners, especially when contractors have to deal with a large number of suppliers, which are invariably different for each project. The costs associated with EDI can be further exacerbated when sources of construction materials are geographically remote.

Web technology can be used to overcome the system incompatibility problem of EDI by encapsulating enterprise systems as object components, made accessible by standardized interfaces, and standardised protocol for transmitting documents between these components through the Internet (Gek, 2000). The Internet provides a transparent means of communication between the buyers and suppliers. Users only need to know the address of the other party. Even though the Internet is a complicated network of switches, communication lines, software, and equipment, it is of no concern to users. The key to this simplicity is the separation of the various user organizations into islands with their own Internet networks connected to the islands by a common protocol (Andreoli *et al.*, 1997). The standardization of network communication technology has significantly reduced the cost for installing a Web site and the unit cost for information transmission also becomes virtually negligible. Web technology thus enables contractors and suppliers to trade construction materials online easily with low transaction cost and to eliminate errors existed in the paper-based document system.

E-commerce as a proliferated business practice has at least four types on the Internet: off-line order off-line delivery; on-line order off-line delivery; on-line order on-line delivery and off-line order on-line delivery (Liang and Huang, 2000). For the off-line order, off-line delivery type, information is available from the Internet, but both ordering and delivery are executed off-line. The on-line order, off-line delivery type of E-commerce system provides on-line information for products and also allows users to make orders on-line. Once ordered, the product will be delivered off-line. In a on-line order, on-line delivery E-commerce system, information for the products is provided on-line, and users can order the products in the system. Once ordered, the products or services will be delivered to the customer on-line. The off-line order, on-line delivery type of E-commerce requires customers to make orders in the traditional way, but the products or services is delivered through the Internet.

Among these four types of business practice, off-line order off-line delivery and the on-line order off-line delivery types are applicable in developing E-commerce systems for construction material exchanges. However, as the off-line order off-line delivery type only makes available information related to material and suppliers on the Internet, both ordering and delivery are executed off-line. This type of E-commerce cannot overcome all the problems that exist in the traditional material procurement process. It would appear however that the on-line order off-line delivery type, however, is more useful, as this type of E-commerce system makes both product information and ordering through the Internet available. Once the user completes the ordering, the ordered products will be delivered off-line to the user. The on-line order off-line delivery type is selected as the basis for developing our E-commerce system for supporting construction material procurement process, as this type can improve



the efficiency of information transfer during the ordering procedure in which all parties can communicate and share information via the Internet.

In most construction material trading circumstances, there are three major players: *buyers, suppliers and agents* (brokers). Buyers are customers who purchase certain materials and products. Suppliers are products and/or services providers. Agents are intermediaries who help the buyers and suppliers to complete a transaction. The buyer and supplier must exist in any trading, while the agent exists only in certain trading situations. A good E-commerce system should support various trade situations. In the next section of the paper, some major trading situations are discussed, which is followed by a description of an E-commerce system designed for construction material trading.

## TRADING SITUATIONS AND SYSTEM DESIGN

By discussing with professionals involved in construction material procurement, the authors have identified the following four trading situations frequently encountered in construction material trading. The four trading situations are *bargaining, bidding, auction and contract*.

Bargaining is a trade situation in which the buyer negotiates with the supplier until an acceptable deal is reached. Usually, the buyer finds a supplier, examines product price and other terms, and negotiates in order to obtain a better deal. If the deal fails, the buyer finds another supplier to bargain again until the buyer is satisfied with the deal.

Bidding is a trading situation that involves a buyer and many potential suppliers. The buyer compares the received bids and chooses the best one. A typical bidding process includes the following steps: the buyer firstly calls for bidding after determining the specification amount and base price; bidders then submit their bids; the buyer chooses the best bid; at last the buyer pays for and the winner delivers the products and/or services.

Auction is a trilateral trading situation that involves a supplier, many potential buyers and an agent who handles the auction. The buyers bid sequentially to compete for the object to be sold. A typical auction process includes the:

- supplier determines the bottom price of the object to be sold;
- agent announces the object and calls for an auction;
- potential buyers assess the value and bid for the object sequentially;
- agent chooses the buyer who offered the highest price which is also higher than the bottom price; and
- winner pays and the supplier delivers the object. Commission fees are paid to the agent.

Contract is a trading situation in which both buyers and suppliers are constrained by a set of mutually agreed rules. If there is no contract, then both sides need to negotiate for an agreement. If a contract already exists, then ensuring accurate implementation of individual orders under the regulation of the contract becomes the primary concern. A typical trading process under contract often includes the:

- buyer informs the supplier to deliver certain products or services,
- supplier confirms the request, and
- buyer pays and the supplier delivers the products and services according to the contract terms.

An E-commerce system for assisting product procurement creates electronic links between suppliers, buyers and agents (Sirinivasan, 1994; Wang and Seidmann, 1995; Choudhury and Konsynski, 1998). These links can be organized in different ways. As shown in Figure 3, buyers and suppliers can either form direct connections without any intermediary (a), with intermediaries (b), or acquire the products through electronic markets (c) (Strader and Shaw, 1997). These three types of connections allow product information of suppliers and the request for product by buyers to be accessed through a network, which provides a platform for buying and selling of products electronically.

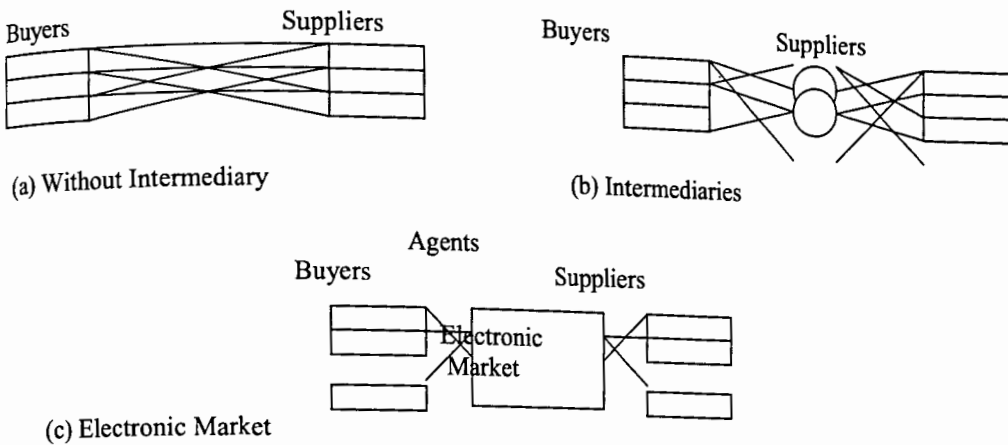


Figure 3: Three types of buyer-supplier communication structure

From Figure 3, it can be seen that type (a) provides direct linkage between suppliers and buyers, which supports bargaining and bidding trading situations, but it is difficult to support other trading situations. Type (b) allows buyers to search and compare more products from the intermediary's platform and facilitates trading situations such as auctions and contracts based trading, but the intermediary becomes an unavoidable part of the supply chain which makes it inconvenient to have direct communications between buyers and suppliers. Therefore, type (b) cannot support bargaining and bidding trading situations. The electronic market in type (c) provides a platform for the suppliers to put their product information online. Buyers can easily search and compare products of a pool of suppliers, and to contact suppliers directly. If necessary, buyers can also invite the agents to undertake certain tasks required in order to complete a transaction. Thus, type (c) has the most flexibility and functionality to support all the four trading situations encountered in construction material trading. The E-commerce business model presented in this paper is therefore based on the type (c). To facilitate the four trading situations, the E-commerce system presented has the following modules: *E-catalogs*, *bidding*, *requisition quotation*, and *order*, as shown in Figure 4. Each of the module functions within the E-commerce system will now be discussed.

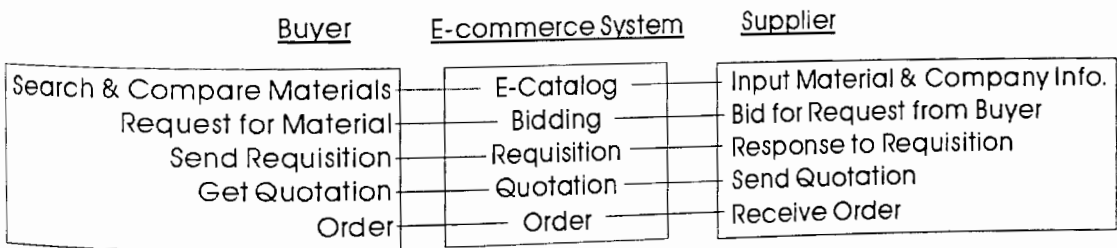


Figure 4: An E-commerce system for construction material procurement

## **E-catalog Module**

The E-catalog module provides an interface for suppliers to advertise their product information into a classified material catalog. The product information includes the price, units, photos, brand names, quality standard and other relevant details so as to allow the buyers to make judgments on the suitability of the products. Information on suppliers such as the company name, address, telephone, email and service details should also be provided. The searching function of the E-catalog allows buyers to specify searching criteria such as a price range, categories and keywords so that the desired materials and products can be found quickly. Also, retrieved results will be presented in a way that enables comparisons to be made.

## **Bidding Module**

The bidding module allows buyers to specify materials they want to buy when they cannot find suitable materials from the E-catalog. Suppliers can view buyers' requests for materials on-line and to bid for the request. Messages are sent to the buyers instantly to inform them of the responses from suppliers. A buyer can accept a bid on-line and this will constitute an order from the buyer to a supplier. The buyer and supplier can then use the order module to follow up the order.

## **Requisition Module**

The requisition module allows buyers to send requisitions to suppliers after suitable materials have been identified from the E-catalog. Although the unit price of each material is stated in the system, suppliers may give discounts to buyers according to the amount of purchases, payment methods and their relationships with buyers. Supplier can view the requisition on-line and then use the quotation module to reply to the buyer.

## **Quotation Module**

The quotation module allows suppliers to send quotations to buyers after receiving requisitions. Buyers will receive notice of the quotations and be able to view the quotation details on-line. They can then use the order module to raise orders.

## **Order Module**

The order module allows buyers to send orders to suppliers. The buyer can use the order module in three cases: 1) once suitable materials are identified from the E-catalog the buyer wants to make a direct order, 2) the buyer receives a quotation from the supplier, and 3) the buyer accepts a bid from the supplier. Both the buyer and the supplier can use the order module to proceed with the transaction.

The above modules are the main modules of an E-commerce system developed to facilitate construction materials trading. The E-commerce system has been implemented using ASP as the Web programming language and Oracle as the database for storing data and information on a server. The implementation of the E-commerce system is described in the following section.

## **IMPLEMENTATION OF THE E-COMMERCE SYSTEM**

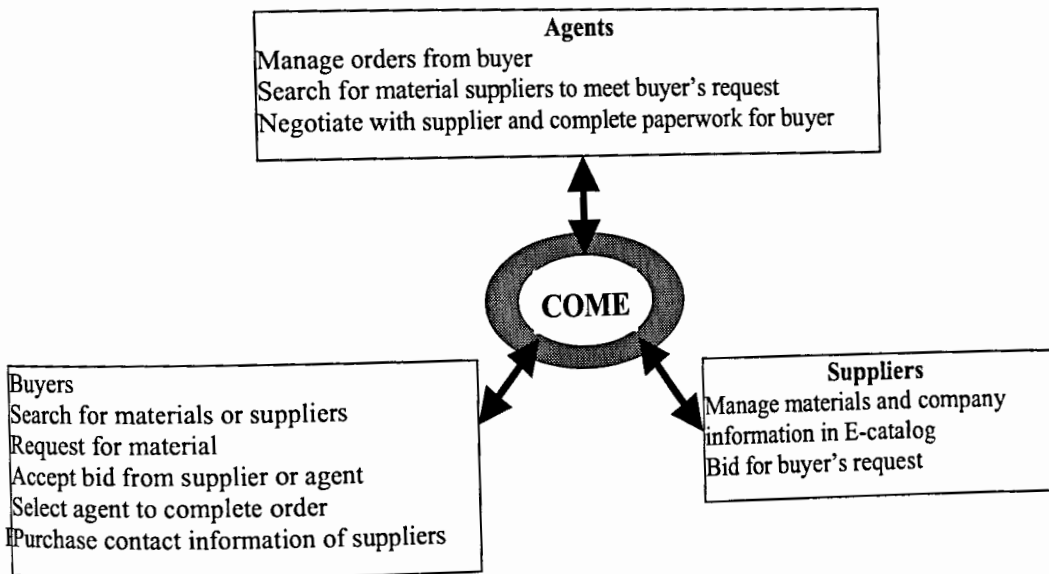
The Web address of the E-commerce system is <http://bsnt42.bre.polyu.edu.hk>. The E-commerce system is called COME, which is the abbreviation of "CONstruction Materials Exchange". The COME system adopts an on-line order off-line delivery model of operation. It is a trading model that is based on the type (c) of the buyer-supplier communication structure, as illustrated in Figure 3. The COME system has five main modules, as indicated in Figure 4, which enable buyers and suppliers to execute the four trading situations previously described. To cope with unexpected trading situations, the system also provides additional services such as building up user profiles, tracking the trading process,

and learning the trading experiences. In order to explore the usefulness of the system, the research team worked closely with a commercial firm by which a professional version of the COME system has been developed and is located at <http://www.VHcome.com>.

### Business Model of COME

In designing and implementing the COME system, it is assumed that most suppliers would be from China, whereas buyers can be from anywhere in the world. The reasons for making such assumptions include that firstly over 90% of the construction materials used in Hong Kong are from China and contractors in Hong Kong have expressed the need of an E-commerce system to expedite the trading process. Secondly, most material producers and suppliers in China have no proper channel to contact buyers from outside of China. The E-commerce system developed is therefore intended to provide a platform for suppliers in China to advertise their products so that trading activities with buyers from anywhere in the world can be conducted on-line.

In the current legal and business environment, exporting goods and products out of China involves preparing considerable amounts of paperwork required by various governmental bodies, buyers who do not have sufficient knowledge of the statutory regulations and business culture in China will have difficulties to fulfill the paperwork. To solve this problem, the E-commerce system has not only the buyers and suppliers as two major user groups, but also the agents who can be the brokers in negotiations and auctions, and also carry out all other duties required by the buyers and the suppliers. These duties include the search of suppliers' information, the preparation of all paperwork required in executing the trading transaction and shipping the products and materials to the buyers. This is because the agents are familiar with the business environment and regulations in China. Without them, it is very difficult if not impossible to sort out all the paperwork involved in exporting commodities from China. On the other hand, without agents, buyers from outside of China will find that it is very troublesome and expensive to conduct negotiations with suppliers in China. The agents can therefore be very helpful to these buyers. The business model of COME is illustrated in Figure 5. This figure summarizes the roles and functions of the three major parties in the COME system: buyers, suppliers, and agents.



The E-catalog in the COME system contains over two thousands categories of construction materials classified into seventeen trees with a maximum of four levels of information. With this structure, the search for product information commences at a general level. If more specific information is required, then the searching process will lead to the next level of information. A Geographic Information System (GIS) is provided to assist the search of material information in specific geographic regions of China. By using the GIS system, the buyers can define the searching areas by selecting the cities on the map or by specifying a circular area with a given central point and its radius. The system will then find all suitable material information within the area together with the associated costs for transporting the material and/or products from the suppliers to the buyers.

Functions provided for buyers also include sending requests for materials and accepting bids from suppliers, selecting agents to complete orders and purchasing contact information of suppliers. Readers should note that the buyers do not know who the supplier is when they find materials from the E-catalog. Buyers have to choose to purchase the contact information of suppliers so that they can contact the suppliers directly, or to select an agent to complete the order for them.

The suppliers can use the COME system for the following purposes: adding and maintaining materials and company information in the E-catalog, reviewing the current market situation in terms of material prices and buyers' requests, and bidding for buyers' requests. Functions provided for the agents include managing buyers' order, and bidding for buyers' request. Some screen captures of the COME system interfaces are shown in Figure 6.

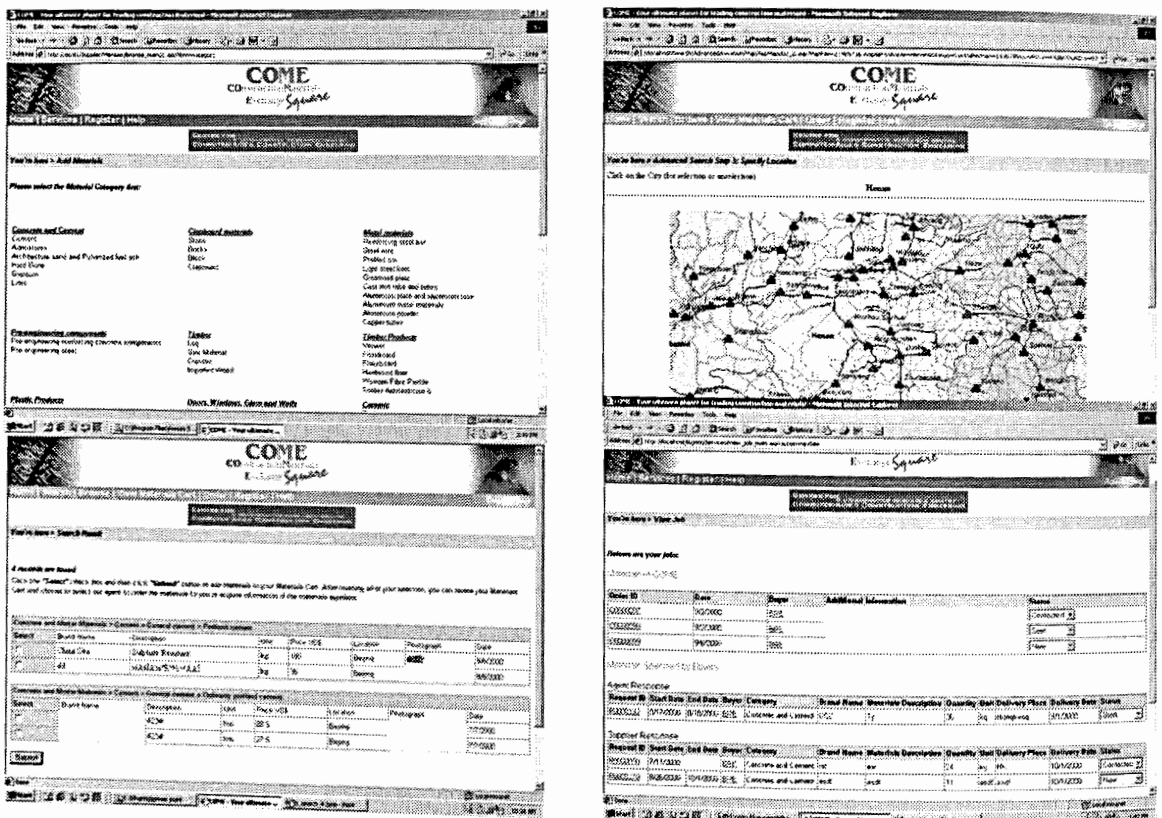


Figure 6: Interfaces of COME system

## Current Status of COME

Currently the professional version of the E-commerce system has over two thousand registered buyers, twenty-nine thousands registered suppliers and one thousand agents registered in the COME system. Experiments are being conducted to compare the time and costs required to procure construction materials in the traditional way and through the E-commerce system. Users opinions about the effectiveness of the COME system will also be collected and analyzed.

The next stage of development will incorporate features such as intelligent agents and data mining techniques into the E-commerce environment. Intelligent agents are software entities that possess internal knowledge to perform certain tasks intelligently. The use of intelligent agents in an E-commerce system can support the users at three different levels (Liang and Huang, 2000): *market level, transaction level and activity level.*

At the market level, intelligent agents can assist the users (buyers and suppliers) to select a proper trade type for their business deal. Intelligent agents at the transaction level ensure that the selected trading type is executed properly. At the activity level, intelligent agents can perform a specific task in the users' decision making process. Data mining technique is used to distill knowledge from raw data. The application of data mining techniques will enable us to generalize useful knowledge and information such as the profiles of the users, the most frequently used searching patterns, and the general patterns in delivery, payment and other issues. These types of information will be extremely useful not only to the users, but also to the system administrator responsible for maintaining the operation of the E-commerce system.

## CONCLUSION

This paper identified the limitations of the traditional construction material procurement method and identifies those areas of E-commerce applications that may help to solve the problems. Models of trading situations, as well as the typical types of communication structures used in E-commerce development are discussed. A design and implementation of an E-commerce application for construction material procurement is presented. The E-commerce system has been upgraded to a professional version, which is now used by suppliers in China and buyers in Hong Kong. As the next stage of the research project, useful features such as the intelligent agents and data mining techniques will be incorporated into the E-commerce to further enhance its capacity. The contribution of this research lies at the identification of the trading situations and types involved in construction material procurement process. These trading situations and types provide essential guidelines for developing a business model for an E-commerce system. The design and implementation of the E-commerce system serve as an initial step towards evaluating the practicality and usefulness of the application of E-commerce in supporting construction material procurement.

## ACKNOWLEDGEMENT

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# The Development of Information Technology Architectures (ITAs) and their Contribution to Organisational Responsiveness

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## ABSTRACT

*Throughout the 1990s MIS executives consistently reported that building a responsive IT infrastructure was their number one key concern. The importance of information technology architectures, and the problems associated with the lack of them, is widely reported in the practitioner literature and surveys. Recent reports indicate that the problem of integrating legacy business applications into an e-Business (e-B) system, is the major impediment to more wide-scale use of e-B.*

*Nick Price, Chief IT Architect of the Dairy Farm Group, sums up the organisational importance of an appropriate ITA as follows.*

*'The value of the technical architecture I think is immense. You just have to look back at the investment decisions that have been made in our, or any, organisation. Hindsight is always easy, but I can tell you we have spent many millions of dollars over the last three years on technologies that were simply incorrect at the time or have been proved incorrect today, because the people who made those decisions did not have an understanding of how those technologies related to the business... Frankly we could have developed 5 or 10 technical architectures for the same cost.*

*The value of a technical architecture is immeasurable, and the cost by comparison, I believe, is almost trivial. It is so significantly valuable to the organisation that I cannot conceive in the modern age of any organisation going forward without a technical architecture'.*

*Video accompanying (Price, 1998)*

*However, despite the obvious importance of ITAs to the IS practitioner community, the academic IS literature in this area is scant.*

*This paper first attempts to outline what ITAs are and how they contribute to organisational responsiveness and agility. It goes on to describe, by reference to a specific ITA planning and implementation process - The Open Group's Architectural Framework or 'TOGAF' - how an enterprise could go about creating and implementing an organisationally appropriate ITA.*



## INTRODUCTION

### The Purpose of this Study

The primary motivation for this preliminary study arose from a practitioner's request for sources of information on the design and implementation of ITAs. That request resulted in the formulation of the following questions.

What is an ITA?

What is the role and importance of an ITA?

What sources of information are available on the design and implementation of ITAs?

What might an organisation need to do to design and implement an ITA?

### The Methodology Used in this Study

The first activity in the study was to carry out an academic literature search. The main tool used for this was ProQuest's on-line database (ABI/INFORM) of refereed journal articles. The second activity was to carry out a practitioner 'literature' search. The main tools used for this were web search engines. The information resulting from these searches was supplemented by information obtained from a number of textbooks and the author's own 'tacit' knowledge. The final activity was to analyse and interpret the material obtained from the earlier stages. The general research techniques and paradigm used for this study can be loosely mapped to Tesch's 'hermeneutic interpretation' (Tesch, 1990) within Burrell and Morgan's 'Interpretive' paradigm (Burrell, 1979).

### Contents of this Paper

The remainder of this paper consists of four main parts. The first part starts by examining the role and importance of ITAs. The second part, elaborates upon the meaning of the term ITA by means of a city planning analogy. The third part, outlines The Open Group's Architectural Framework (TOGAF). This part of the paper, together with the Appendix, provides an answer to the research question '*What sources of information are available on the design and implementation of ITAs?*' It also provides a partial answer to the question '*What might an organisation need to do to design and implement an ITA?*' The last part of the body of the paper contains the '*Conclusion & Further Research Questions*'.

## THE ROLE AND IMPORTANCE OF IT ARCHITECTURES (ITAS)

### The Role of IT Architectures in Business and IS Planning

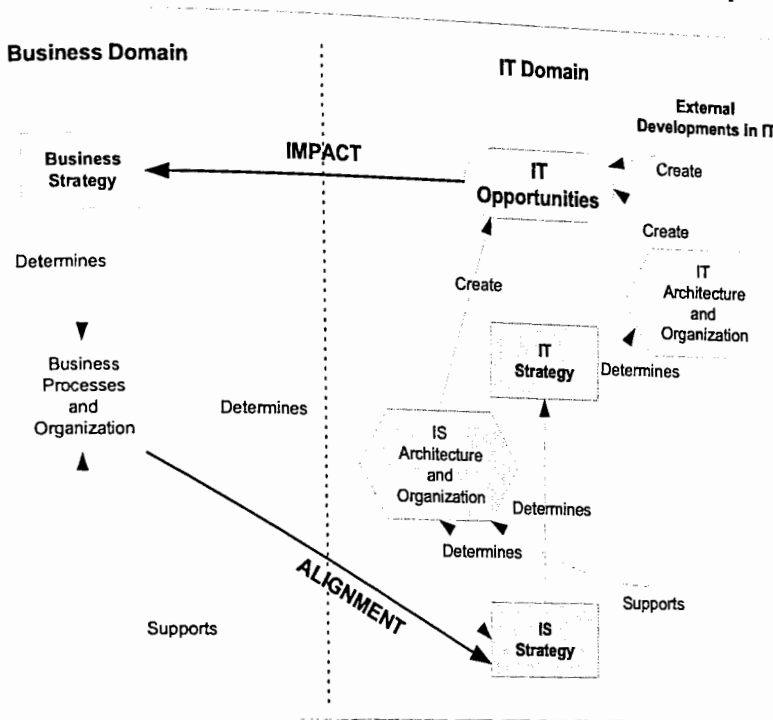
Despite the increasing speed and discontinuous nature of business change that has taken place in the last decade many academics and practitioners still believe that some form of business planning is still necessary. Many would also argue that new developments in IT often present companies with the opportunity to obtain competitive and strategic advantage and, therefore, IS and IT factors need to be incorporated into organisations' business strategy planning exercises. Jack Callon expresses these views as follows.

'.....because of the pace you have no choice – an organisation must do an effective planning job or get lost in the maze of increasing complexity. .... If information systems are to be an integral part of the implementation, then they need to be addressed at the same high level, at least in terms of the role they will play'.

(Callon, 1996, pps. 284 – 287)

The strategic planning process model shown below in Figure 1 provides a framework that can be used to both develop effective business strategies and the necessary IS to support them. It also provides a structure that allows new IT opportunities to be identified and fed into the business planning process in a way that can make major changes, or impacts, upon the final outcomes of the process.

Figure 1: The IS/IT impact framework  
(Adapted from Callon, 1996)



We can 'see' from the Callon model that an IT architecture (ITA) is the technical foundation for an effective IT strategy and that an IS architecture is the foundation for an effective IS strategy which in turn provide the IS foundation of any successful modern business strategy. Unfortunately, the diagrammatic model doesn't tell us what an 'architecture' actually is!

However, the Open Group provides the following definition:

'an architecture is a formal description of an information technology (IT) system, organized in a way that supports reasoning about the structural properties of the system. It defines the components or building blocks that make up the overall information system, and provides a plan from which products can be procured, and systems developed, that will work together to implement the overall system. It thus enables you to manage your overall IT investment in a way that meets the needs of your business'.

(TheOpenGroup, 2000)

Later in this paper we use a city planning analogy to further illustrate the meaning of ITA. For now, it suffices to say that the well-architected computer system is like a well-planned city where districts, buildings, and services function well together to serve the needs of the inhabitants. Whereas a poorly-architected system is more like an unplanned urban sprawl

## The Importance of IT Architectures in IS Management and Research

Since the start of the open systems movement in the 1970s many organisations' ITAs have become increasingly dynamic. Today, the widespread adoption of open, but rapidly changing, Internet technology is the most visible manifestations of this. However, the benefits of open systems do not come without problems. One of the main problems is managerial complexity. Nezelek et al. describe this as follows.

'The emergence of the Internet and the Web offer unprecedented opportunities as well as challenging management problems. In the midst of an ever-increasing set of technology choices, IS managers must still confront fundamental questions regarding the nature of underlying technology infrastructures and the application of rapidly shifting technologies to business decision-making'.  
(Nezelek, 1999, p. 1)

The importance of ITAs, and the problems associated with the lack of them, is widely reported in the practitioner literature and surveys. According to Laartz et al. *'Stories about companies that stumbled because their IT architectures couldn't accommodate rapid and drastic change are legion'*. (Laartz, 2000) (p. 119). The Delphi Group's survey of businesses in the e-B arena reports that the respondents cited technology issues, particularly the problem of integrating legacy business applications into an e-B system, as the major impediment to more wide-scale use of e-B. (TheDelphiGroup, 2000)

The results of a number of surveys of IS executives' key concerns have been published in academic journals in the United States since 1980 (Ball, 1982). Similar studies have been replicated in Hong Kong, Australia, Europe and Asia. These surveys usually cover CIOs who are asked to rank a list of 20-30 IS management issues in terms of importance over the coming three to five years.

Three of the issues that always occur in these survey questionnaires can be regarded as being concerned with ITAs. Of these 'Building a Responsive IT Infrastructure' is probably most closely aligned to ITAs. Table 1, below, shows the ranking of these ITA issues in four surveys carried out between 1989 and 1999. The surveys include one carried out in the US in 1989 (Niederman, 1991), another carried out in the US in 1994 (Brancheau, 1996), one carried out in Australia in 1996 (Pervan, 1998), and one carried out in Hong Kong in 1999 (Ma, 2000).

**Table 1: Ranking of ITA issues in Critical Issues of IS Management Surveys (1989-1999)**

Critical Issues of IS Management	Lit. Rank	US 1989	US 1994	AUS 1996	HK 1999
Building a Responsive IT Infrastructure	14	6	1	1	2=
Making Effective Use of the Data Resource	21	2	7	3	2=
Developing & Implementing an Information Architecture	20	1	4	4	7

It is clear, from the above table, that CIOs have consistently regarded ITA issues as critical management issues for the last decade - particularly since the 1994 survey. The Australian study (Pervan, 1998), also provides data on CEOs ranking of the issues - they ranked 'Building a Responsive IT Infrastructure' second out of a total of 31 issues. There is a significant (at the .01 level) positive correlation (0.65) between the CIOs' and the CEOs' rankings in this study.

The 'Lit Rank' (literature ranking) column values were obtained from Palvia et al.'s research (Palvia, 1999). Their research analysed academic publications, published between 1989 and 1991 and compared the ranking of the number of articles published, relevant to each of the critical issues, with the critical issue ranking obtained from the 1989 CIO survey (Niederman, 1991). It is disappointing, to note that many of these important issues get relatively little coverage in the academic literature.

In the following section we use a city planning analogy to further illustrate the meaning of ITA.

## A CITY PLANNING ANALOGY

### The Need for a Process to Create Architectures

Due to continuous changes in business requirements many organisation's legacy applications are now so unfit for current needs that major chunks of them need to be replaced. At the same time, their IT departments are continually being asked to add new functions to meet completely new business requirements. They are also asked to integrate the previously independent, and often logically and technically incompatible systems of different business units and newly acquired subsidiaries. For organisations active in the e-B space the IT function is now required to *'automate and webify the entire value chain, linking supply chain partners and customers under a single automated system'*. (TheDelphi Group, 2000) (p. 1)

In their article, *'The Paris guide to IT architecture'* Lartz et al. suggest that this situation is analogous to that faced by city planners. They go on point out that:

'City planners try to preserve viable old assets, to replace outmoded assets, and to add new assets—all in the context of an infrastructure linking them coherently. IT developers have a good deal to learn from that approach'.  
(Laartz, 2000, pps.118-119)

The noun 'architecture' conjures up to some visions of design drawings, product standards, and vendor specifications. To others, in the IT world, it conjures up visions of an enterprise-wide client-server network, SAP R/3 (4.6), particular 'platforms', and so on. None of these are architectures. More important, however, is the fact that organisations do not just need a static ITA - they need a dynamic architectural process. The city planning analogy encapsulates this idea as do Price and McClelland when they say that the charter for their (The Dairy Farm Group) technical architecture group is:

'To conceive, design, populate, publish and continually improve a Technical Architecture for the Dairy Farm Group'

(Price, 1998, Slide 18)

Their simple statement conveys the dynamic nature of the process by the inclusion of *'continually improve'*. It also conveys the very important point that 'paper' designs need to be populated - or implemented.

The purpose of the architectural process is to create an architecture that meets the business requirements of the organisation and then to implement that architecture using the most appropriate technology. Today, business requirements change quickly and technology, particularly in the e-business arena, changes even more quickly. Clearly, the architectural process used to align the two needs to be dynamic. The challenge facing organisations is to create an ITA planning and implementation process (ITAPIP) that can provide flexible ITAs that can accommodate the replacement of obsolete components without having to obsolete the architecture itself. These components may be chunks of applications code, chunks of systems software (e.g. operating systems), or chunks of hardware and so on. An effective ITA should allow the organisation to preserve and renovate those old IT assets that are still viable while replacing obsolete ones and adding new ones in an orderly manner. In order to make this feasible the ITA also needs to provide a good service infrastructure that connects the different assets into a coherent whole.

## City Planning as an ITAPI Analogue

Laartz et al.'s city planning analogy is particularly useful because it encapsulates three concepts that are central to the ITAPI process. These are 'building-blocks', 'services' and 'interfaces'. The analogy also puts in clearer focus the need for long-term planning and governance.

**The Building-block Concept:** Laartz et al. point out that most cities have building zone regulations that designate particular areas to particular uses. Many organisations have existing ITAs that are more analogous to Bangkok than Paris. Their ITAs appear to be tangled and chaotic and show little evidence that any form of organised planning has been applied. One of the first stages of coherent ITA planning, in this type of situation, will be to try to create a logical model of the building blocks we already have, and might want to re-use, as well as candidate building blocks we may need in the future. In a well-designed architecture although building blocks have discreet functions they should share common data and processes in order to prevent redundancy and its resultant inconsistency.

**The Need for Standard Services:** Laartz et al. point out that:

'To offer neighborhoods standard services such as power and water, a city needs a stable infrastructure. The infrastructure must serve prospective as well as existing needs .....

(Laartz, 2000, p. 122)

The need for the standardisation of data management services is now fairly well accepted in many organisations. However, many other types of service, (such as security services, location and directory services, and network services) are becoming increasingly important in the world of e-B. The inclusion of service building blocks in an ITA has the benefit of preventing redundancy and its resultant inconsistency.

The need for Standard and Stable APIs: Laartz et al. go on to say:

'...The infrastructure must...have uniform interfaces—including the same types of outlets, plugs, and voltages—so that business can be carried out not just among neighbourhoods but across an entire country'.

(Laartz, 2000, pps. 122-123)

In the past the interfaces between physical building blocks, such as applications programs, were hand crafted by programmers. This approach gives rise to two major problems. First, every time a programmer alters the code of an application he may introduce new errors into it - the stability problem. Second, when we need to upgrade an application package we find out that we cannot just patch our hand crafted interface code into the new version of the package because the new version is obviously not exactly the same as the old version - the package version migration problem.

These problems can be solved if we put a rule into our architecture that says we will only populate our ITA with software, including software service modules, that uses open standard and widely used APIs. This is equivalent to using the '*same types of outlets, plugs, and voltages*' in the Laartz et al. analogy.

**The future role of web services and interfaces in e-business:** Laartz's reference to '*...across an entire country*' is particularly important in the e-business (eB) arena. 'Web' services are so called because the company that provides the service implements it on a web server and makes it available to prospective users (usually the prospective user's computer application) via open APIs. Web services can include both traditional business services, such as the provision of goods and services, and IT services such as the use of a remote routine (via a remote procedure call) to convert from USD to DEM at today's exchange rate. Most of today's eB applications can only transact Internet-based business with global trading partners who already have knowledge of one another - including the nature of each other's web services AND how to interface to each other's web services or computer applications.

Future eB applications, particularly automated business-to-business applications will require some type of electronic 'yellow pages' system that allows our computer system to locate the web services we require TOGETHER with the technical details of how these services can be requested or provided. Architecturally this web services directory would become an additional layer on top of existing cross-platform interoperability standards and APIs.

In fact such a web services directory layer is a core component of both the proposed ebXML and the Universal Description, Discovery and Integration (UDDI) project. Both these projects are centered on a proposed 'yellow

pages' architectural layer that allows the potential user (usually the prospective user's computer application) of a web service to use this layer to discover, deploy and execute the service.

Note: the ebXML project was initiated by UN/CEFACT and OASIS (Organization for the Advancement of Structured Information Standards) in September 1999 and the UDDI project was started in September 2000 by IBM, Ariba and Microsoft.

**The Need for Long-term Planning and Governance:** The analogy captures another important similarity between ITAs in the business world and city plans in the civic world - i.e. politics plays an important role in the success or failure of both. In order to succeed, the ITA must reflect the needs of the organisation and senior management must be persuaded that it does so. An ITA imposed without appropriate political backing is bound to fail. In short, an ITA once produced must be followed, or it is useless.

Formal IT governance practices are therefore required. The purposes of these practices is to ensure that the senior management of the organisation retains control of, and responsibility for, **all** aspects of the IT operation and not just the ITA. However, the overall IT governance strategy must include an ITA compliance strategy backed up by specific measures - such as involving the ITA team in product procurement.

## **A BRIEF TAXONOMY OF ARCHITECTURES & THEIR INTERRELATIONSHIPS**

So far we have only discussed ITAs. However, toward the start of this paper Fig 1., *'The IS/IT impact framework'*, included an IS architecture as well as an ITA. For the purposes of this paper we will assume that together they form the 'Enterprise Architecture'. We will further assume that the IS architecture can be subdivided into the following three components.

The **business (or business process) architecture** that defines the business strategy, governance, organisation, and key business processes.

The **application (systems) architecture** that provides a blueprint for the individual application systems to be deployed, their interactions, and their relationships to the core business processes of the organisation.

The **information (or data) architecture** that describes the structure of the organisation's logical and physical data assets and data management resources.

It is important to realise that these three types of architecture are closely related. In particular the following points need to be born in mind.

The ITA must closely reflect the business goals of the organisation.

The ITA is closely related to the applications architecture because it is the applications that will directly use the services it provides.

Additionally, the ITA will typically need to support the integration of different application architectures that may have been developed independently of one another.

The ITA will need to be able to support the storage and access requirements of the data architecture as well as provide required infrastructural services – such as directory services. Conversely, the ITA will generate new data requirements of its own which must be provided for by the data architecture.

## **AN EXAMPLE OF AN ITAPIP (TOGAF)**

Nezlek et al.'s definition of 'enterprise computing architecture' is rather different to our definition of enterprise architecture. They say that *'The term "enterprise computing architecture" is used to describe the set of computing platforms and the data networking facilities to support an organisation's information needs'* (Nezlek, 1999) (p. 82). Their definition of enterprise computing architecture, is in fact, much closer to our definition of an ITA.

Nezlek et al. go on to say:

*'Despite this (organisational reliance on IT), effective strategies for specifying an enterprise computing architecture are still lacking'*.  
(Nezlek, 1999) (p.1)

The results of recent searches of several online databases of academic journal articles, carried out by the author of this paper, add some support this claim. However, the fact that academic journals do not contain any *'effective strategies for specifying an enterprise computing architecture'* does not mean that such strategies are not widely published elsewhere. The Appendix to this paper contains brief details of six such 'strategies'. In this paper we will refer to such strategies as 'ITA Planning & Implementation Process (ITAPIP) Frameworks'

In this section of this paper we will examine one of these ITAPIP Frameworks - The Open Group Architectural Framework (TOGAF)

### **What is TOGAF?**

TOGAF is a tool for defining an ITA. It is described in a collection of electronic documents and online databases published by The Open Group and available on its public web server (TheOpenGroup, 2000). The development of TOGAF started in 1995 and was originally based on the Technical Architecture Framework for Information Management (TAFIM), developed by the US Department of Defense.

TOGAF consists of two main parts:

The Architecture Development Method (ADM), which explains how to derive an organisation-specific IT architecture that addresses business requirements.

The Foundation Architecture is an architecture of generic services and functions that provides a generic foundation on which more specific architectures and architectural components can be built and includes:

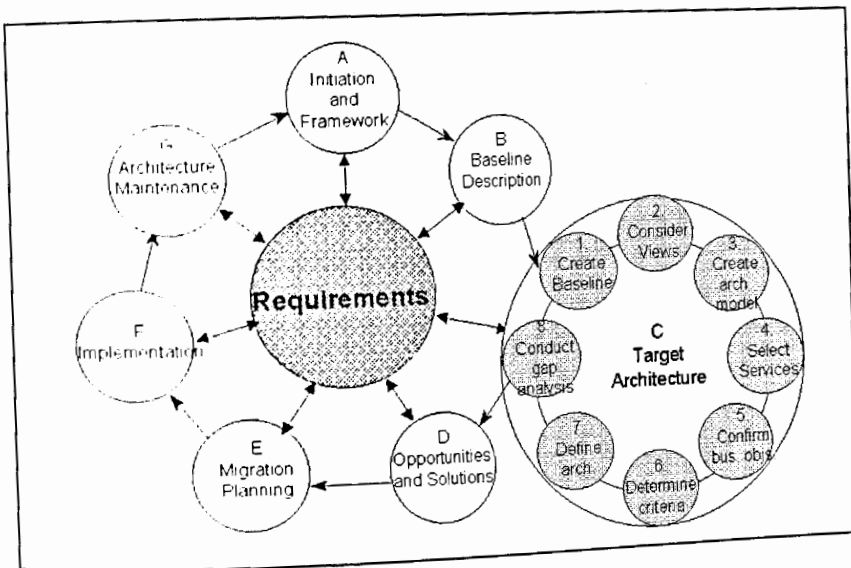
the Technical Reference Model (TRM) which provides a model and taxonomy of generic services; and  
The Standards Information Base (SIB), a database of open industry standards that can be used to define the particular services and other components of an organisation-specific architecture

The ADM first provides a method of obtaining information about the benefits and constraints of the existing implementation, together with requirements for change. It then provides a way of combining these two to create a 'target architecture' (or set of architectures). The SIB can then be used to define the specific services and components required in the products that will need to be purchased in order to implement the developed target architecture.

### The TOGAF Architecture Development Method (ADM)

The TOGAF phases are iterative, both within each phase and among phases. Throughout the phases of the cycle there needs to be frequent validation of the results against the original business requirements and constraints. Each phase of the cycle is further divided into steps. The seven phases of the cycle, the continuous validation against business requirement, and the sub-division of phases into steps is shown below, in diagrammatic form, in Figure 2. Note that only one of the phases, phase C, of the cycle has been shown in sub-divided form in the figure. This has been done because although the ADM covers the complete architecture life-cycle the focus of TOGAF is primarily on phase C, the creation of the 'Target Architecture'.

Figure 2: Phases in the TOGAF Architecture Development Method (ADM)  
Source (TheOpenGroup, 2000)





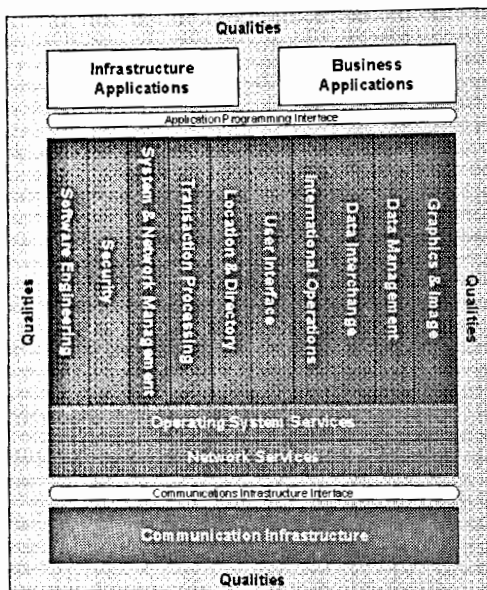
## The TOGAF Foundation Architecture

As explained earlier the **Foundation Architecture** a generic architecture. This generic architecture is used as a template in Phase C from which a specific target architecture (our ITA), that meets the business requirements of the organisation, is created. It was also explained earlier that the Foundation Architecture has two main components:

the Technical Reference Model (TRM) and  
the Standards Information Base (SIB).

Figure 3, shows a diagrammatic representation of the model and taxonomy of generic services provided by the TOGAF TRM.

**Figure 3: TOGAF's TRM and taxonomy of generic platform services**  
(Source: TheOpenGroup, 2000)



The TRM identifies a set of services for each general service category. For example, TRM 'Security Services' are composed of the following nine services.

- Identification and authentication services
- System entry control services
- Audit services
- Access control services
- Non-repudiation services
- Security management services
- Trusted recovery services
- Encryption services
- Trusted communication services

(Note: the 'Qualities' area in the diagram indicates that the architect also needs to identify the level of quality the organisation requires for each required service - i.e. QoS).

Each service can then be related to an on-line Standards Information Base (SIB) entry. The SIB is a (dynamic) database of industry standards for populating a target architecture. The SIB provides the technical architect with a set of tools for defining the standards that a target ITA will prescribe, and for checking the availability in the market place of products guaranteed to conform to those standards.

Figures 4 to 7 demonstrate how some of the SIB facilities can be used. Fig. 4 shows the screen that is displayed after selecting the service category 'Security Services' and then selecting the service type of 'Identification and authentication services' from the drop down menu that first appears. The screen identifies the three different standards that meet the search criteria.

Figure 4: TOGAF standards information base (SIB) search result example

Service category and Type	Reference and status	Title and Year	Short Description	Other Views
Security Services Technical Standard	C902 (CDSA) Adopted	Common Security CDSA and CSSM, Version 2 - Two Volumes 1999	An Architecture (CDSA) for extensible and interoperable security solutions.	Details Full SIB Comment
Security Services IETF RFC	IETF RFC 2222 Adopted	Simple Authentication and Security Layer 1997	Describes a method for adding authentication support to connection-based protocols	Details Full SIB Comment
Security Services Technical Standard	ISO/IEC 10441 Adopted	Generic Security Service API (GSS-API) Base 1995	Defines a generic application programming interface to security services	Details Full SIB Comment

SIB Whenever possible we have identified contact points for further information. If you can't find the information you need, please contact The Open Group at any of its offices.

By clicking on the 'Details' hyperlink further details of each of the selected standards can be obtained from the SIB. Fig. 5 shows the results of clicking on the 'Details' hyperlink for one of these standards – C902 (CDSA).

Figure 5: Details of security service standard C902 (CDSA) retrieved from the SIB

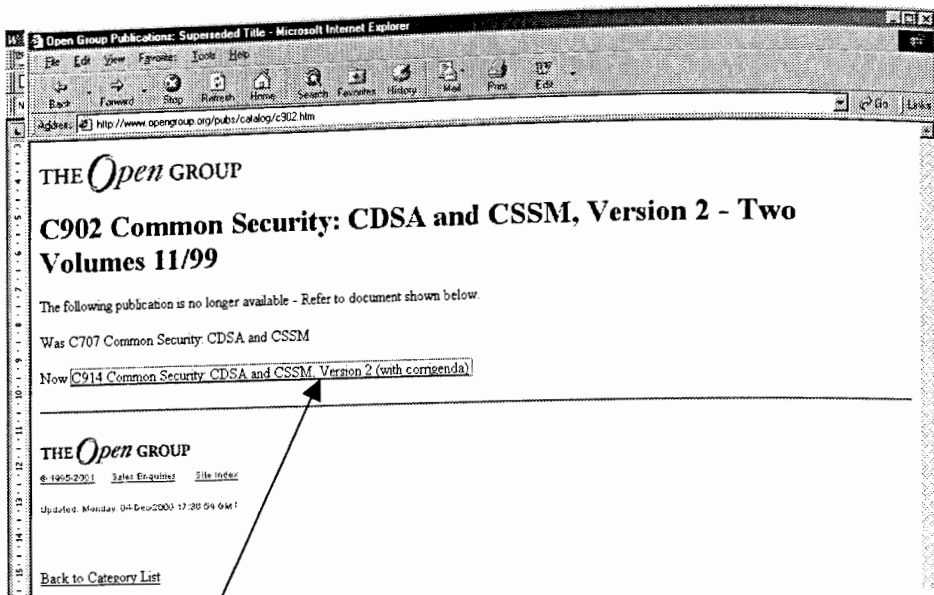
Standards Information Base (SIB) - details

Entry ID: C902

<b>Title</b>	Common Security CDSA and CSSM, Version 2 - Two Volumes
<b>Reference</b>	C902
<b>Common name</b>	CDSA
<b>Year of Publication</b>	1999
<b>Status</b>	Adopted
<b>Short Description</b>	An Architecture (CDSA) for extensible and interoperable security solutions.
<b>Service category</b>	Security Services
<b>Service</b>	Identification and Authentication Services
<b>Type</b>	Technical Standard
<b>Description</b>	The Common Data Security Architecture (CDSA) is a set of layered security services that provide the infrastructure for extensible and interoperable security solutions. These solutions cover all the essential components of security capability. The CDSA Technical Standard is organized into 15 parts, each addressing specific aspects of the security architecture, and catering for the needs of both infrastructure implementers and applications writers. Published in 2 volumes.
<b>Usage</b>	
<b>See also</b>	
<b>Supersedes</b>	
<b>Superseded by</b>	
<b>URL</b>	<a href="http://www.opengroup.org/tech/standards/ata/ata02-902.htm">http://www.opengroup.org/tech/standards/ata/ata02-902.htm</a>

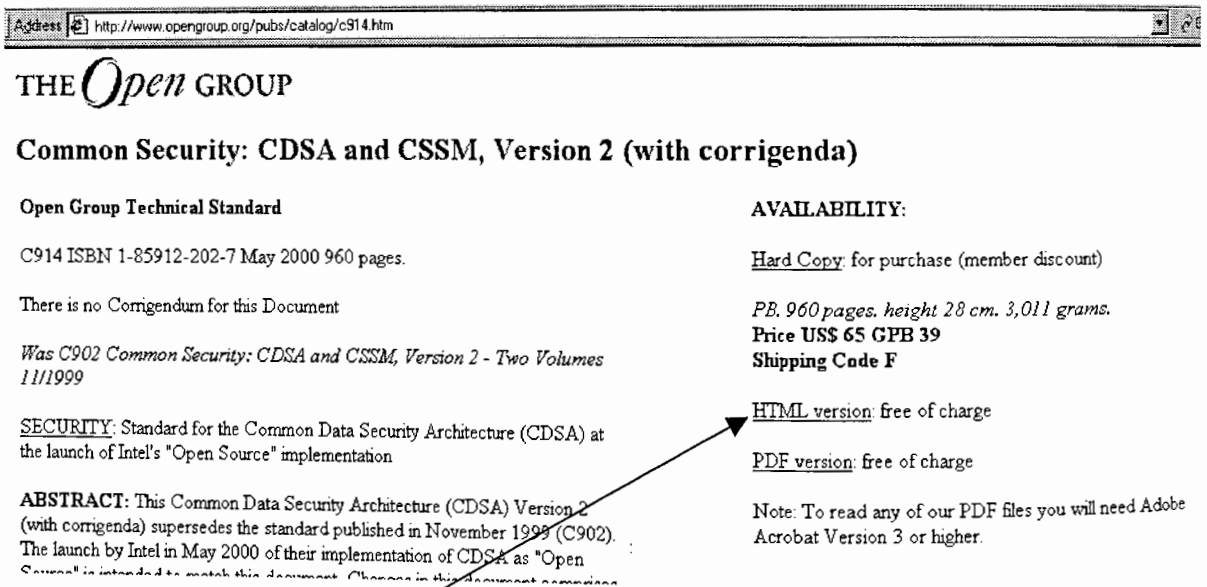
Clicking on the hyperlink shown at the bottom of Figure 5 retrieves further details of the standard from the SIB – as shown in Figure 6.

Figure 6: SIB hyperlink to location of full specification of security service standard C902



Clicking on the next hyperlink displays a screen from which the full specification of the standard can be downloaded in HTML or as a pdf file.

Figure 7: SIB hyperlink to full specification of security service standard C902



The screen above contains links to where the full specification of C902 (960 pages) can be downloaded.

The TRM represents the ITA, or application platform, as a single, generic, conceptual entity. The ADM provides a means of mapping the TRM to a specific target architecture that meets the organisation's business requirements that were previously determined in the ADM cycle. During this mapping process the organisation will generally find that it does not need all of the TRM services or service categories – it may even find that it needs additional services. What is certain is that the set of services identified and defined for the application platform will change over time. New services will be required as new technology appears and as application needs change.

The physical application platform that actually gets implemented as the target ITA will typically not be a single entity. Generally it will be a combination of different entities such as web server, database server, DBMS, different application package architectures, and so on. Many of these real-world IT systems, that are procured and used today to implement an ITA, already come equipped with many advanced services, which are often taken for granted by the purchaser.

For example, the SAP R/3 applications software package will run on top a wide variety of DBMSs and operating systems etc. The software itself implements services from many of the service categories of the TRM. Organisations that implement R/3 usually use consultants to design and configure a suitable (for implementing R/3) ITA as well as the R/3 services and applications functionality. Since the purchaser of an R/3 system often does not consider anything smaller than the total bundle of services that comes with the system, that service bundle can very easily become the organisation's platform. Indeed, in the absence of an organisational ITA to guide the procurement process, this is invariably what must happen. As this process is repeated across an organisation, different systems purchased for similar functions such as VoIP call-centre systems, CRM systems, etc., can contain markedly different bundles of services.

One of the first major tasks of the IT architect is to analyse the existing collection of real-world platforms, already in use within the organisation, in terms of the service bundles, or building blocks, they provide. Subsequently the architect needs to map the conceptual TRM platform to an organisation-specific IT architecture. To do this he must analyse the services actually needed in order to create an ITA that meets the organisation's business requirements in an optimal manner. Then, in order to implement the ITA, the organisation needs to procure real-world 'platforms' and products, i.e. service bundles or building blocks, that contain the required services and comply with the standards now embodied in the organisation specific ITA.

## CONCLUSION & QUESTIONS FOR FURTHER RESEARCH

This paper has demonstrated how ITAs provide a framework for the implementation of a responsive IT infrastructure. The results of a number of studies show that IS managers have consistently regarded the building of a responsive IT infrastructure as a key issue. Somewhat surprisingly the results of the Palvia et al. study (Palvia, 1999) reveal that this issue receives relatively little attention in the IS (academic) literature.

However, a considerable amount of work has been carried out and published in this area by a number of industry groups (identified in Appendix 1). This paper has outlined one of these ITA frameworks, TOGAF, which prescribes what an organisation should do to design and implement an organisationally appropriate ITA.

This initial study raises a number of further questions including:

Does the academic IS world still pay relatively little attention to the key issues reported by IS managers and, if so, why?

What are IS managers doing to address their key concern of 'building a responsive IT architecture'?

These questions may be worthy of further research.

## APPENDIX:

### OTHER ITA PLANNING & IMPLEMENTATION PROCESS (ITAPIP) FRAMEWORKS

TOGAF, which has already been outlined in this paper, is only one of a number of ITAPIP frameworks in use today. Many of the other frameworks have much in common with TOGAF.

#### **CORBA (Common Object Request Broker Architecture)**

This is under development by The Object Management Group (OMG) and is an object-oriented architecture designed to support distributed computing and application integration. The OMG's object management architecture (OMA), sometimes referred to as the CORBA architecture, is an object-oriented application architecture centred on the concept of an object request broker (ORB). The ORB acts as a switching centre, locating objects, storing interface definitions and object implementations, and relaying messages between objects in a distributed heterogeneous environment. CORBA services are a low-level set of common object services covering functions like object creation and deletion, naming, security services, etc. CORBA facilities are higher-level functions such as distributed documents or printing. Domain Interfaces are vertical market-specific interfaces which will provide common facilities for applications within a particular market sector or industry. The OMA is currently under extensive development both for revision of existing interfaces and for extensions of the architecture into new areas.

Further details of CORBA can be obtained from:

<http://www.corba.org/>

#### **The C4ISR (The Command, Control, Computers, Communications (C4), Intelligence, Surveillance, and Reconnaissance) Architecture Framework**

The C4ISR Architectural Framework has now (in January 2000) replaced its predecessor - the 'Technical Architecture Framework for Information Management' (TAFIM). Both were developed by the US Department of Defense. The C4ISR Architecture Framework now provides a framework that gives comprehensive architectural guidance for all DoD areas, in order to ensure interoperable and cost effective military systems. The framework is already being used in government areas beyond the defence sector.

Further information on C4ISR can be obtained from:

<http://www.fas.org/irp/program/core/c4isr.htm>

#### **DCE (Distributed Computing Environment)**

This was also developed by the Open Group and can now be regarded as a supplement to TOGAF – even though it was developed before TOGAF. DCE provides a set of services that can be used as the basis of a DCE-Centric Architecture related to TOGAF. DCE forms a layer between the application and the operating system and network services; it has been implemented in a variety of products supplied by a number of vendors including Transarc's (now owned by IBM) DCE-Encina middleware.

Further details of DCE can be obtained from:

<http://www.opengroup.org/tech/dce/>

## IEEE 1003 series standards (aka POSIX 1003)

Provided an architectural framework built on open systems standards. The 1995 ISO/IEC technical report 'Guide to the POSIX Open System Environment' was used in the development of the US Department of Defense Technical Architecture Framework for Information Management, (TAFIM). TOGAF was, in turn, developed from TAFIM. IEEE 103, TAFIM, and TOGAF all use a similar reference model at the conceptual level of their frameworks.

Further details of IEEE 1003 can be obtained from:  
<http://standards.ieee.org/catalog/posix.html>

Note however, that the latest versions (March 1999) of the IEEE 1003 standards (IEEE 1003.2 c and 1003.2d are both designated as *drafts and withdrawn* which means that both are neither finished nor worked on by the IEEE any longer.

## ISO RM-ODP (The ISO Reference Model for Open Distributed Processing)

RM-ODP was developed as a coordinating framework for the standardisation of Open Distributed Processing. It created an architecture within which support of distribution, internetworking and portability can be integrated. The 1995 version of RM-ODP ((ISO/IEC DIS 10746-1:1995) provided a framework to support the development of standards that will support distributed processing in heterogeneous environments. It identified the important properties of open distributed systems as openness, integration, flexibility, modularity, federation, manageability, provision of quality of service, security and transparency,

Further information on RM-ODP can be obtained from:  
[http://www.dstc.edu.au/cgi-bin/redirect/rd.cgi?http://archive.dstc.edu.au/AU/research\\_news/odp/ref\\_model/ref\\_model.html](http://www.dstc.edu.au/cgi-bin/redirect/rd.cgi?http://archive.dstc.edu.au/AU/research_news/odp/ref_model/ref_model.html)

## OCCA 6 (The Open Cooperative Computing Architecture)

This was based on NCR's Enterprise Architecture Framework. The NCR Enterprise Architecture Framework was originally created to guide the development of systems, industry, and customer specific architectures.

Further details of OCCA (6.0.2) can be obtained from:  
<http://www3.ncr.com/architecture/occa6/>

Please note that this page has not been updated since 2 July 1997

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# An Exploration Of The Relationship Between ERPs, Best Practice and The Supply Chain

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## ABSTRACT

*A number of studies suggest that, even though supply chain management (SCM) is not a new concept, many organisations and industries are only just starting to recognise the importance of managing or exploiting their supply chains through applications such as ERPs. Very little research, however, has documented the extent to which this can be achieved using software systems based on the premise of 'best practice'. This paper suggests that a better understanding of the complexity of supply chains in the context of best practice will provide a better understanding of the extent to which ERPs can support supply chain initiatives.*

*Keywords: Supply chain, supply chain management, Enterprise Resource Planning systems (erps), best practice*

## INTRODUCTION

Even though the supply chain (SC) and supply chain management (SCM) are not new concepts many organisations and industries are just starting to recognise the importance of managing or exploiting their supply chains. 'The supply chain refers to all those activities associated with the transformation and flow of goods and services, including their attendant information flows, from the sources of raw materials to end users. Management refers to the integration of all these activities, both internal and external to the firm.' (Ballou et al, 2000). In Baatz (1995) it is suggested that conceptually it extends from "dirt to dirt". It begins 'when the raw material is extracted from the earth and ends when the product is reused or disposed of in a landfill'.

## DISCUSSION

Many organisations are recognising that any competitive advantage they might have achieved from their back office systems is no longer sustainable. In looking for alternative methods of (sustainable) competitive advantage organisations are exploring ways of exploiting the extended (external) supply chain.

## SUPPLY CHAIN MANAGEMENT

Anderson, Britt and Favre (1997) argue that '[t]o balance customer demands with the need for profitable growth, many companies have moved aggressively to improve supply chain management.' In other words, some organisations are moving away from the traditional autonomous operating unit towards alliances and integration across the supply chain. Neumann, Ringbeck and Schwegmann (2000) note that companies who are performing best are those that are investing in systems that integrate their internal and external supply chains.



In the past supply chain systems were regarded as channels of distribution with each firm operating on its own, seeking to make the highest profits (Lancioni, 2000, Prahalad and Ramaswamy, 2000). We are now seeing a shift from these traditional business roles. 'Major business discontinuities such as deregulation, globalisation, technological convergence, and the rapid evolution of the Internet have blurred the roles that companies play in their dealings with other businesses.' (Pralhad et al, 2000). Cross-enterprise supply chain planning is seen as an opportunity to achieve sustained competitive advantage.

'The inherent complexity of a global supply chain requires the efficient and effective coordination of all of the resources of the enterprise.' (Challener, 1999). He suggests that for an organisation to be ever more responsive to its markets, partners and customers, new strategies are required for supply chain integration, supply chain optimization and inter-enterprise collaboration. However, he points out that there are cultural and technological barriers to implementing cross-enterprise supply chain management processes.

Industries are also beginning to recognise the value of their customers and their knowledge of the market place (Pralhad and Ramawamy 2000, Chizzo 1998, Simchi-Levi et al 2000, Anderson et al 1997, Challener 1999, Fall 2000). Organisations can achieve more accurate demand forecasting which enhances scheduling and enables inventories to be reduced, production becomes more efficient through planning optimization, products are delivered to customers on time and suppliers and customers can develop closer relationships, which allows them to share information more closely (Challener 1999, Sarkis and Sundarraj 2000).

The Internet has made possible the idea of integrating processes, not just transactions. This raises the issues of costs, intrafirm adaptability, interfirm adaptability, platform neutrality and interoperability, scalability, security, reliability, ease of use, customer support and perceived value (Sarkis and Sundarraj, 2000). These are issues that were repeatedly unresolved in EDI implementations (Krcmar, Bjorn-Andersen and O'Callaghan 1995).

### **ERPs and the supply chain**

ERP systems started life as inward looking control systems that originally did not consider all aspects of the supply chain. Typically, ERP vendors provided modules for finance and accounting, human resources, marketing and sales, manufacturing, maintenance and engineering (Sarkis and Sundarraj, 2000). They were primarily implemented to help reduce costs and improve productivity (Manji, 1998). More recently they have broadened their scope to include advanced planning and scheduling solutions. Al-Mashari and Mohamed (2000) comment that 'SAP R/3 has been widely implemented to create value-oriented supply chains that enable a high level of integration, improve communications within internal and external business networks, and enhance the decision-making process'

### **BEST PRACTICE AND THE SUPPLY CHAIN**

Malhotra (2001) refers to benchmarking as identifying and storing best practices for use by other employees. O'Dell and Grayson (2000) note that a wealth of knowledge and best practice is available from within the organisation and often remains untapped while organisations concentrate on external benchmarking. Dahle (1996) points out benchmarking is not about copying the best practice of another organisation but adapting the best practice to suit their own needs and culture.

The extended supply chain is complex and can be difficult to perceive. Mapping best practice across the supply chain requires assessment 'from supplier relationships to internal operations to the marketplace, including customers, competitors, and the industry as a whole' (Anderson 1997). ERPs offer powerful transaction processing based upon industry 'best practices'. Anderson (1997) points out that many of the companies implementing ERPs will generate large amounts of data that management cannot easily use. Reutterer and Kotzab (cited in Lancioni 2000) are challenging the idea of a best practice solution for supply chain management. Malhotra (2001) suggests that organizations may find themselves doing 'more of the same, better and better with diminishing marginal returns' which may be appropriate for routine processes but would be unsuitable in a dynamic environment where organizations 'need imaginative suggestions more than they do best practices'. Anderson argues that 'excellent supply chain management calls for creativity and flexibility'. Holmberg (2000) recommends that organisations take a holistic view, focusing on the relationship between all activities along its supply chain.

## RESEARCH APPROACH

A case study approach, using the Australian Wine Industry, forms the basis of the research. The Australian wine industry, until 20 years ago a cottage industry, is now exporting a huge amount of wine to the UK, Europe, USA, Asia and New Zealand. The growth of wine exports has created a new set of business relationships worldwide that has resulted in a more complex extended supply chain for the industry. The industry faces the challenges of designing its supply chain to achieve or maintain strategic advantage, developing and maintaining collaborative relationships within and between functional areas, forging supply chain partnerships and managing information for effective decision making.

The aim of this research is to examine supply chain initiatives in the industry and the extent to which ERPs, based on best practice, can support these initiatives. Four stages of the research have currently been identified. The first stage is to map the extended supply chain of the wine industry using Checkland's (1999) Soft Systems Methodology (SSM). SSM was chosen as it offers an approach that helps to describe and analyse complex systems and reveal the key elements of the rich set of interrelationships in the modern wine industry.

The second stage will identify what the industry expects to achieve from its supply chain in order to provide (sustainable) competitive advantage. A pilot study (questionnaire and interviews) will be used to identify the supply chain requirements of the industry. This will be summarised and presented at a series of electronic meetings, using a keypad-based group process support system.

The third stage will explore the capabilities of supply chain systems that incorporate 'best practice'.

The fourth stage will examine the relationship between the industry's supply chain, and the extent to which its Enterprise Systems, based on 'best practice', can support supply chain initiatives.

## CONCLUSIONS

It has been argued by a number of protagonists that ERPs can effectively support the extended supply chain. However, studies examining the link between ERPs, best practice and supply chain management are limited. There is plenty of evidence of experiences EDI implementations to provide a good understanding of the technology issues relating to creating inter-organizational links. However research has mainly focused on organizations as autonomous units using software to interface independent processing systems.

This study seeks to examine the supply chain in the wine industry 'from dirt to dirt' and the extent to which ERPs, based on best practice, can support it. If businesses need flexible systems able to respond to market demand, undertake advanced forecasting, as well as reduce operational costs and improve efficiency, they must consider to what extent ERPs can support supply chain initiatives when they are difficult to change, complex, and slow to respond to the more complex information demands of the external supply chain.

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# **promoting Reflective Practice through a WORKING Skill Inventory**

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## **ABSTRACT**

*Over the past decade there has been a growing concern about the role of higher education institutions, and how they are meeting the needs of employers. Increasingly, universities are being asked by industry, government and funding authorities to help prepare students for industry with appropriate professional and work related skills. How then can tertiary educators design and implement learning activities to promote these skills?*

*In this paper we will investigate a conceptual framework to promote the development of professional skills through reflective practice. Students are given a validated, testing instrument to identify their strengths and weaknesses in this area at the beginning and end of the semester.*

*Keywords: Reflective Practice, Professional Skills, Higher Education*

## **INTRODUCTION**

Increasingly, higher education institutions are being asked by industry, government and higher education funding bodies to produce graduates with versatile professional or workplace skills, as well as subject-specific skills. This is causing a major reappraisal of higher education institutions purpose, learning outcomes and research activities. (Australian National Training Authority, 1998; Bennett, Dunne, & Carre, 1999; Candy, Crebert, & O'Leary, 1994; Dearing, 1997; Mayer, 1992).

As higher education institutions struggle to implement the development of these professional skills, they must firstly define what these skills represent. There are currently several synonyms for these including generic, key, core, life, competencies, employment, transferable, personal and others. These terms usually refer to "skills that are common to more than one work site, more than one occupation or more than one field of knowledge" (National Board of Employment Education and Training, 1996, p. 17). The Mayer Committee (1992) and the Finn Review (1991) identified the following as being required by graduates: working in teams, communicating clearly, personal and interpersonal skills, problem solving, understanding technology and using mathematical concepts efficiently. The range of different professional skills that cut across different occupations makes it impossible to define one definitive set of generic skills needed by all graduating students.

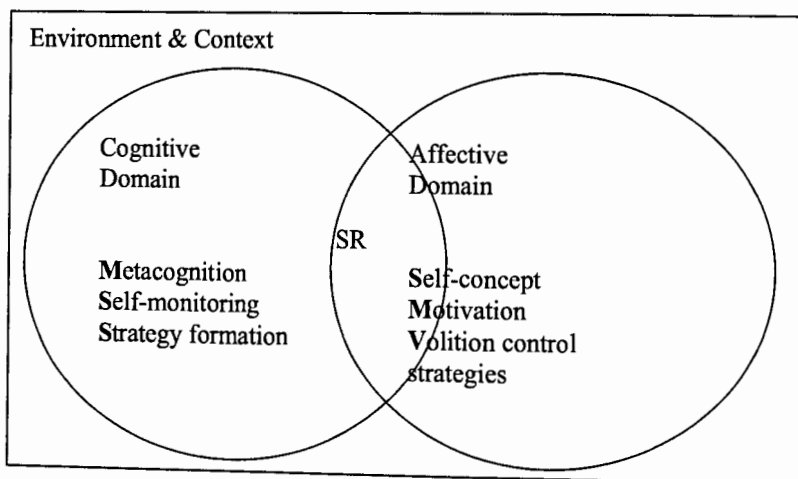
Even more difficult problems are being realised by higher education institutions when trying to implement appropriate teaching and learning strategies for the development of these skills in different disciplines. Resistance from lecturers to remove subject content in order to teach or integrate generic skills, and different perceptions of importance from students about learning these skills all contribute to making this a difficult task (Bailey, 1993; Leckey & McGuigan, 1997).

In this paper, a conceptual framework is considered, which promotes reflective practice through the use of a validated, on-line testing instrument – WORKING (Miles & Grummon, 1996). The instrument can be administered on-line, from which a full analysis is performed of the results and immediately returned to the student and tutor for consideration. This assessment helps students translate what they have learnt at university into skills needed for the workplace through explicit feedback on how well they are prepared for the workplace.

## CONCEPTUAL FRAMEWORK

Teachers are good at transferring domain specific knowledge, but the learner can only generate the skills required by industry with the teachers' role becoming that of a facilitator. A model of Self-Regulation (McMahon & Oliver, 2001) is proposed that identifies the cognitive and affective dimensions essential to learners being able to activate and sustain the states, processes and strategies that are essential to working in environments where tasks are ill structured and non-domain specific.

Figure 1 identifies the key components of this model. It accommodates the role of both affective and cognitive aspects of self regulation, but also acknowledges the effects of external environmental factors upon an individual's ability to regulate their learning. Self regulation is viewed here as the intersection of self awareness at both a rational and emotional level. Metacognition and self concept are seen as the primary enabling process in this model, with self monitoring and motivation as subordinate processes which are involved in the development of cognitive and motivational strategies.



**Figure 1: A model for Self Regulation**

Self Regulated workers are able to think about their own thought processes, and are confident in their skills. Markus and Nurius (1986) cited by (Garcia, 1994) introduce the notion of self-schemas, which combine the cognitive and affective elements of self-awareness as "the cognitive manifestation of enduring goals, aspirations, motives, fears and threats." This overarching notion highlights both the similarities and differences between self-concept and metacognition. At the heart of each is an awareness of self, and while high self-consciousness is associated with a desire for self-knowledge, low self-consciousness breeds intellectual defensiveness.

The above psychological states are enacted by, and through, the processes of self-monitoring and motivation. Motivation results from the actualisation of self-concept. Anxiety, for example leads to a low level of motivation (Zimmerman, 1989), while those with a high level of metacognition monitor their thinking; a necessary process for being able to transfer understandings to new situations. The processes of motivation and self-monitoring led to the enactment of strategies. These strategies are both the end product and enabling tools that support the reflection and reflexivity necessary for the acquisition of generic working skills. It has been argued that

Professional skills are created through student-centred learning activities and reflection within a community of peers (Schon, 87; Kolb, 84). The strategies proposed within the above model can include activities such as journal and concept mapping, as well as the integration of techniques such as peer collaboration and bulletin boards. It has been proposed that encouraging students to solve problems while simultaneously reflecting on their own problem solution process can improve their metacognitive knowledge, skills as well as performance (Boekaerts 1997). However, the assessment of these skills poses problems.

Ultimately, the psychological conditions for the development of generic skills are internalised and not always easily articulated by an individual in finite terms. A tool needs to be developed that identifies the behaviours and attitudes that indicate the psychological states of metacognition & self-concept, as well as the key motivational and self-monitoring processes. It must be determined whether or not strategies for the maintenance of effort and reflective practice are manifest. Such a tool may also offer a role beyond pure assessment, by allowing students to reflect on their weakness, and have customised scaffolding given by tutors. It has been argued that one approach to the development of such professional skills is through explicit training about them (Brooks, 1997). An effective measure may also play a profound role in the promotion of the generic professional skills that are advocated within a self-regulatory framework.

## **ASSESSING PROFESSIONAL SKILLS**

In this paper we propose using a validated testing instrument that allows students to reflect on and assess their own skills through on-line administration. It is used as a pre-test at the beginning of the semester to help students understand where they have strengths and weaknesses, followed by customised advice on how to develop "weaker" skills, so they can reflect on and practice these skills during the semester. At the end of the semester, a post-test is administered to check for changes, and again allow students to reflect on their strengths and weaknesses.

The WORKING assessment instrument (Miles & Grummon, 1996) is a self-assessment package for workplace skills, designed to help students understand what skills employers require, and how they rate against these. These skills are generally quite different to the regular academic and technical competencies students are normally tested for. WORKING is designed to give students feedback on nine professional skills, to help tutors and students identify areas in which students can benefit most from educational interventions to develop customised strategies.

The WORKING assessment instrument was created in US through a series of national and state surveys of workplace skills, reviewed to determine skills areas identified as most critical by employers, which go beyond just specific academic content knowledge (Carnevale, Gainer, & Meltzer, 1991; Commission on the Skills of the American Workforce, 1990; Michigan Employability Skills Task Force, 1987; Secretary's Commission on Achieving Necessary Skills, 1991) The skills adopted initially focused on 24 competency areas, which were reviewed by a panel, based on prevalence in the literature, ability to be taught or trained, and clarity with which it could be defined in assessment. Based on this analysis, nine scales or professional skills were developed, with fifty diagnostic items. The items were field tested during 1995 with sixteen different institutions in rural and city areas, and modified based on statistical results derived from reliability analysis.

The nine skills that make up the WORKING assessment instrument are representative of the cognitive and affective elements of Self Regulation. For example, "Systems Thinking" is predicated by the ability to think abstractly which itself is evidence of a metacognitive state. "Information Processing" is in essence self-monitoring, while the ability to solve problems, indicates a high level of cognitive strategy usage. In the affective domain, a tendency to volunteer, one of the elements described by the WORKING instrument as a commitment to "Life Long Learning" would be highly influenced by a person's self-concept. "Taking Responsibility" and "Persisting" are evidence of the motivational processes and volition control strategies that are manifest in Self Regulated workers. Within the nine scales of the WORKING assessment tool are statements which requires students to reflect on their practice and the extent to which they use strategies for Self Regulation. What follows is a description of each of the scales and how they assess a student's ability to adopt reflective practice in their professional activities.

### **TAKING RESPONSIBILITY**

Measures students desire to complete tasks they begin, and ensure that all aspects of the task are identified and done well. Low scores on this scale indicate that students need to work on learning strategies for identifying the components of a task and setting goals for task completion. Students who consistently neglect their responsibilities may need counselling on the long-term consequences of such behaviour. The items for this scale included:

I keep and use a list of things I've got to do.  
It really bugs me to see a problem that no one is trying to solve.  
I check up to make sure that others have done what they said they would do.  
As soon as I finish one task, I look for another one to do.  
I prefer to let others take the lead in getting something done. (R)

### **WORKING IN TEAMS**

Students' scores on this scale measure the degree to which they feel comfortable working in teams and are able to use the skills associated with effective teamwork. Students who score low on this scale may need more experience in working in teams to accomplish a task. They need to learn the qualities of an effective team member, including taking responsibility for individual assignments and for deciding how the team should accomplish its goal. Communication is also a critical factor in successful teamwork. The items for this scale included:

I don't usually like others giving me suggestions on how I should do something. (R)  
I like working in teams,  
I have found that group decisions are often better than individual decisions.  
I prefer to learn with other people.  
I explain to others why we need to work together.

### **PERSISTING**

Students who score low have trouble sticking with a task or learning assignment long enough to see it to its satisfactory completion. They may give up too soon to really benefit from instruction. Students who score too high may be seen as stubborn and unwilling to compromise when such compromise is needed because of limited resources or available time. The items for this scale included:

I won't let go of a problem until I've got it licked.  
I follow through on things no matter what it takes.  
I set definite goals, then keep working on them until I've achieved them.  
If I can't catch onto something quickly, I sometimes just drop it. (R)  
I don't let go of something until I understand it.

## A SENSE OF QUALITY

Students who score low on this scale need help in understanding how exceeding expectations can help them succeed in everything they do. Students may need guidance in learning how to judge what is "just enough" versus "more than expected" and why doing more is beneficial. Students who score low are also likely to need help in focusing in on details and paying attention to the quality with which work is done, rather than simply doing work. The items for the "sense of quality" scale included:

- I do extra work to make sure things are done just right.
- I won't settle for doing the minimum on anything, no matter what it takes.
- I can't quit thinking about something until I'm sure I've done it very well.
- I don't worry about the little details as long as I've done the main things okay. (R)
- I seek out new activities and responsibilities.

## LIFE-LONG LEARNING

Students' scores on this scale indicate an interest in engaging in learning in a variety of settings. Students who score low on this scale have a reluctance to look for learning opportunities and to take advantage of them when they are presented. Students may need help in identifying the many places and ways in which they can learn that go beyond the traditional educational setting. Students who are not motivated to continue learning may find their skills obsolete sooner than they wish. The items for this scale included:

- I don't usually ask questions that go much beyond the immediate task at hand. (R)
- I like to experiment with ideas and possibilities in my head.
- I usually don't make a special effort to learn new things. (R)
- I'm one of the first to volunteer to learn a new procedure or method.
- When I have to wait, I will read anything I find lying around.

## ADAPTING TO CHANGE

Students' scores on this scale indicate their level of comfort with frequent or major changes in their environment. Students who score low are less likely to seek out new experiences or to adjust to changes they experience. Students with a low tolerance for change may have trouble working in many environments where change is the norm. They need counseling to help them identify ways in which they can increase their ability to adapt to change. The items for this scale included:

- I adapt quickly to new situations.
- I usually do something I've enjoyed rather than try something different. (R)
- I am uncomfortable when I have to handle several things at once.
- I worry a lot about what could happen when things are changing. (R)
- I am usually most comfortable when things are predictable.



## PROBLEM SOLVING

Students' scores on this scale indicate their interest and skill at using systematic problem solving methods when approaching complex problems. Students who score low need help in understanding how to approach problems in a step-by-step fashion. Experience in using the scientific method or other systematic problem solving approach should help them increase their skills in this area. The items for the "problem solving" scale included:

- When solving a problem, I keep double-checking to be sure I'm on the right track.
- I make a detailed plan before I tackle a complex problem.
- I consciously consider several different approaches before tackling a problem.
- I will offer a suggested solution whenever I bring up a problem to someone.

## INFORMATION PROCESSING

Students' scores on this scale provide insights into their competence in managing their own learning and in having and using multiple strategies when learning. Students who score low on this measure need to learn methods that they can use to help add meaning and organization to what they are trying to learn. Encouraging students to make active connections to their prior knowledge and experience is important. Equally important may be many basic study skill techniques, like outlining, paraphrasing, and summarizing. The items for this scale included:

- I learn by figuring out how I can apply the things I'm learning to my life.
- I understand new things by seeing how they fit with what I already know.
- I consciously ask myself questions to see how well I understand something.
- I make a mental picture of what I am trying to learn or solve.

## SYSTEMS THINKING

Students' scores on this scale indicate their understanding of the relationship among parts in a system and the effects of actions within a system. Students who have a working knowledge of one system may still need help in translating that knowledge into general principles of systems thinking. Students who score low may be helped by learning the components of a specific system before being introduced to these general principles. These students need to understand that events do not happen in isolation and that their actions may have effects that are distant in time or space.

The items for the "systems thinking" scale included:

- I want to see how one task is related to other tasks.
- I tackle a problem by first trying to see how it affects others.
- I frequently come up with new ideas for how to do things better.
- I know how to get things done in a system or organization.

### **Sample output**

The WORKING assessment instrument (Miles & Grummon, 1996) was used in semester 1, 2001 with a class of ninety final year multimedia tertiary students studying project management methodology. The test was given at the beginning of the semester and end of semester. Table 1, shows a 23% increase for one of the students across each of the nine scales. There was an overall increase of 15% across all of the student scores.

Table 1: Sample WORKING output

	Being Responsible	Team Skills	Persisting	A sense of Quality	Life Long Learning	Adapting to Change	Problem Solving	Info Processing	Systems Thinking	Total
Pre	45	50	15	5	55	95	15	1	1	149
Post	60	90	85	30	85	70	50	45	25	183

## CONCLUSION

Tertiary institutions cannot ignore industry and governments increasing demands to having student graduates with better generic skills. Teaching and assessment strategies are needed to promote the development of these in tandem. Self-regulatory pedagogical approaches are required with valid assessment instruments that offer students feedback and scaffolding during the course of their studies are needed to enable students to focus and practice specific generic skills in which they are deficient.

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# A Pilot Study of Using Intelligent Agents to Support Customer Management in a Cyber Shopping Mall

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## ABSTRACT

*The spread of Internet is so rapid that emerging e-Business is making dramatic changes in this digital economy. An important component of e-Business research is the issue of the effective marketing in the keen competition. Many agents are developed to help buyers handle the dynamic purchasing environment and reduce the complexity of purchasing data. However, while most existing agents are focused on buyers' needs, prior research on agents lacks the sellers' perspectives. This study is intended to demonstrate the agent system that supports analysis of buyers' purchasing data and predicts their behavior so that sellers can develop more systematic marketing strategies.*

*Keywords : e-Business, Intelligent Agents, Cyber Shopping Mall*

## INTRODUCTION

With the widespread of Internet, e-business becomes the cutting edge for today's business. In e-business environments, numerous buyers can access to the website dealing with so many products data to make a purchase decision. At the same time, sellers are facing a very difficult situation to manage back-office requirements in order to keep the quality of customer services (Shaw et al 1997). A variety of agents have been developed to assist buyers in searching websites and making purchase decisions. However, prior research on agents, mainly focusing on buyers' needs, has failed to address the seller's managerial perspectives. Most agents are designed to track the buying path and identify the websites visited to make a final purchase decision while some agents provide a comparison of prices and products details.

These agents can obviously help buyers save their time and efforts by reducing the amount of information to consider. However, as the importance of customer management and more effective sales strategies are required to keep competitive position in the market, sellers might be interested in agents that can analyze the buyers' purchasing pattern and predict their behavior in the websites.

The primary purpose of this paper is to demonstrate a sales agents that supports analysis of buyers' purchasing data and predicts their behavior so that sellers can develop more systematic marketing strategies. The agent system that introduced in this paper monitors buyers' activities in the websites, identifies possible features that might affect purchasing decisions, and finally provides a basis for preparing effective marketing strategies with suitable alternatives.

Moreover, existing agent systems do not reflect the time constraint. Consequently, they can't provide the timely adjustment based on the seasonal variation and the change of fashion. The agent system in this paper applies the adaptive system that considers the change of preferences based on the seasonal change and recommends the products at the latest fashion. Those information reflected in the change of preferences gives sellers insights to satisfy the buyers' needs and predict the product pattern that are attractive to the buyers.

This paper describes a cyber shopping mall using intelligent agents that incorporates considerations for buyer behavior analysis and purchasing pattern monitoring as well as time variations based on the change of season and fashion. The system considers the various aspects of the buyer behavior during the website search and suggests a guideline that sellers can concentrate on the factors to attract the buyers by analyzing the product selection process and the purchasing pattern.

## LITERATURE REVIEW

Agents are computer programs that mimic human actions to address the needs of sellers and buyers to cut cost while improving the quality of goods and services and increasing the speed of customer services (Machlis 1999). Major characteristics of agents include personalized, continuously running, and autonomous, reactive and proactive. Jennings and Wooldridge (1998) describe properties of agents as follows.

**Autonomy:** agents operate without the direct intervention of humans or others.

**Social Ability:** agents interact with other agents and possibly human via some kind of agent-communication.

**Reactivity:** agents perceive their environment (which may be the physical world, a user via a GUI, internet, other agents, etc) and respond in a timely fashion to changes as they occur.

**Pro-activity:** agents do not only act in response to their environment, they exhibit goal-directed behavior and take the initiative.

According to Nissen (1995), agents are classified into five categories: watcher agents, learning agents, shopping agents, information retrieval agents, and helper agents. Many researchers address the effects of agents on electronic commerce (Jennings and Wooldridge, 1998; Maes, 1994). Mae, Guttman, and Moukas (1999) predict the future development of such agents, and discuss the use of different kinds of applications to assist consumers in buying activities. Examples of these agents include Anderson Consulting's Bargain Finder, Curtin University's Bargain Boat, and University of Washington's ShopBoat (Choi et al 1999).

Intelligent agents perform specific tasks on behalf of users. For example, agents are designed to search the websites for information gathering, monitoring, and analyzing the environment. Some agents are applied to interact with other agent and may act upon messages from other agents. Other researchers predict that monitoring agents will continuously be developed to search the web for deals on behalf of users in e-business, considering that the importance of effective marketing has been increased for the success of e-business (Bogonikolos et al 1999).

Many researches have explored the opportunity to reduce the burden of buyers in gathering information and comparison of the products using comparison agents while push technology has taken part of delivering personalized marketing by analyzing buyer profile and preferences (Li and Huang 2000). These agents have significantly reduced the buyers' time and efforts to examine purchasing data. However, they still fail to address the seller's managerial point of view. Other research issue is reflecting time constraint for dynamically changing environment.

## ARCHITECTURE OF THE SYSTEM

The system basically consists of two agents: the monitoring agent and the buyer analysis agent. The monitoring agent observes buyers' activity when the buyer enters a web site and keeps track of buyers' interests and details of buyers' behavior. The buyer analysis agent generates a database that contains the information of the buyer behavior based on the results given by the monitoring agent. Utilizing the monitoring agent and the buyer analysis agent, sellers can identify the common characteristics of the moving paths, revisit patterns, time interval between the visits and other statistics. Sellers, then, can establish not only an effective promotion strategy but also well-organized product selection to make the website to be more attractive to the buyers.

The architecture of the agent system proposed in this study, as shown in figure 1, consists of user interface, application program, user monitoring agent, and user behavior analysis agent. Functions of each component can be summarized as follows:

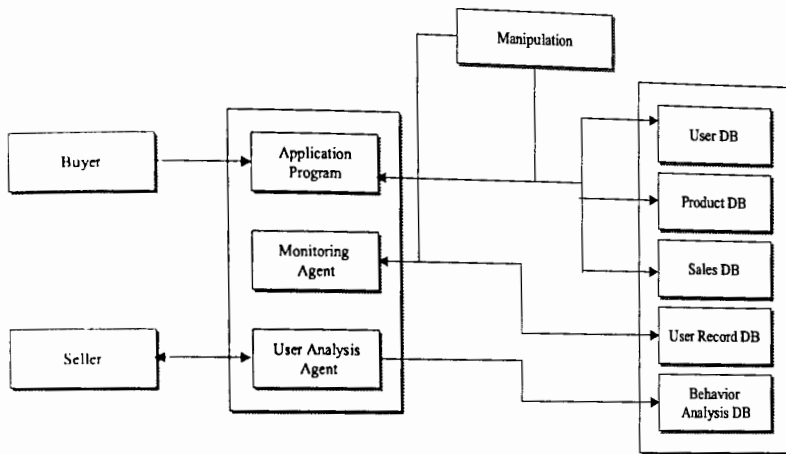


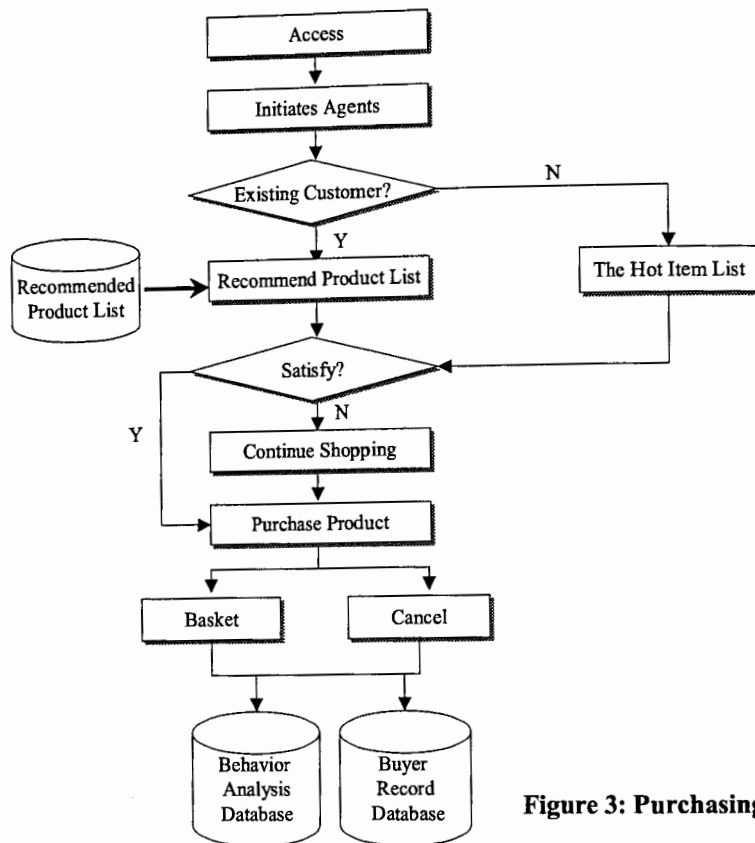
Figure 2: Architecture of the System

User interface: manages a dialog between users and the system.

Application program: enables users to navigate, search, and make a purchase on the website.

Monitoring agent: monitors users behavior on the website and record the data.

Buyer behavior analysis agent: analyze and predict consumer's behavior based on the data from the monitoring agent.



**Figure 3: Purchasing Process Flowchart**

The monitoring agent initiates its function as the buyer gets an access to the website. It differentiates a new buyer from the existing buyers and displays the suitable sets of product lists according to the buyer's status. It usually recommends the hottest items for new buyers and customized product lists for existing buyers. Figure 2 illustrates the process buyers take to complete their purchases. Buyers make a decision whether they keep on shopping or stop based on the recommended list. Sometimes buyers can manipulate their own wisdom to make a purchase decision regardless of the product recommendation

Once the purchase is completed, buyers put the items into the basket. It is the responsibility of the behavior analysis database and the buyer history database to record all the purchase information. The behavior analysis database consists of order file, product file, purchase decision file, and log history file. The buyer record database contains all the buyer related information including http access history file, buyer IP file, log file, and purchase history file.

The recommended product list is drawn based on the previous purchase data, the purchasing pattern, product types, and buyers' personal data. Neural nets, as shown in figure 3, are employed to enable agents to learn the purchasing pattern and predict the future buyer behavior from the previous purchase data and buyer's personal data.

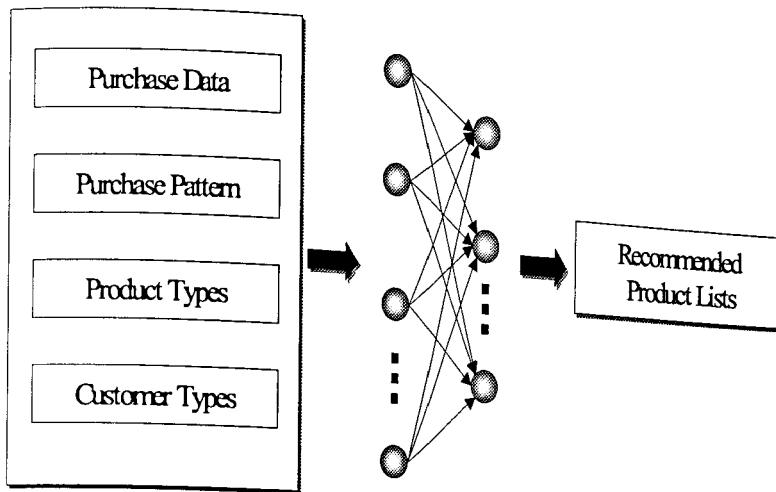


Figure 4: Neural Nets for Recommended Product Lists

Figure 4 shows the Nassi-Shneidermann chart that explains the logic to generate the product list. The agent provides the real-time adjustment by adjusting the weights for the buyer behavior variables.

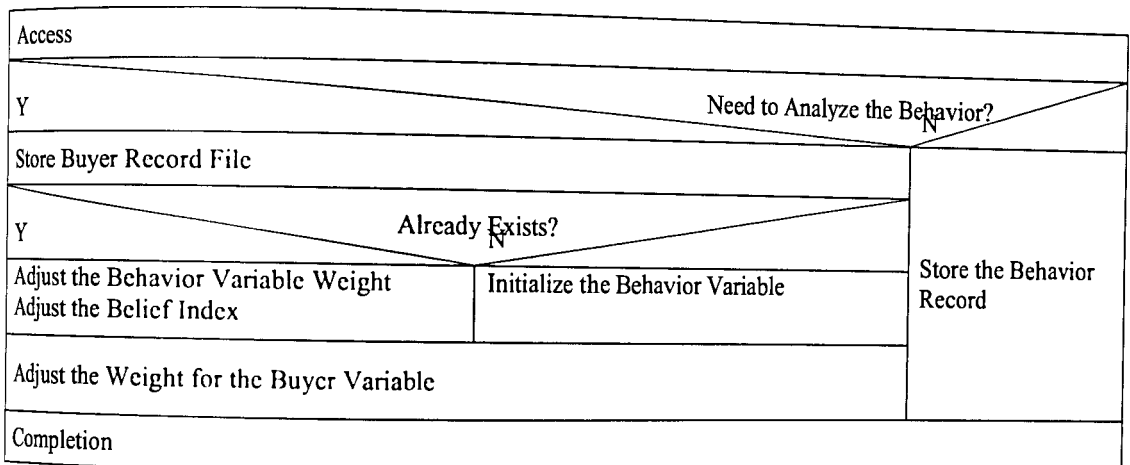


Figure 5: Product List Generation Logic

### AN ILLUSTRATIVE APPLICATION

The target domain of this study is clothing business. The agent system is applied in the website whose URL is [www.3b.co.kr](http://www.3b.co.kr). The System is built in PHP, C-CGI, JavaScript, and is Linux based. My-SQL is used to develop the databases. The back-end office of this site is located in Dongdaemoon Clothing Shopping Mall. The target market is basically Korean at this moment. Consequently, the site is built in Korean. However, for the demonstration purpose, parts of the screens of the website are translated in English. The initial screen of the website is shown in figure 5.





Figure 6: Initial Screen of the Website

### User Log Screen

Figure 6 displays the record that contains the information about visits buyers made to the website. The log file can be analyzed by IP address, Jobs the buyers performed, and the order placed.

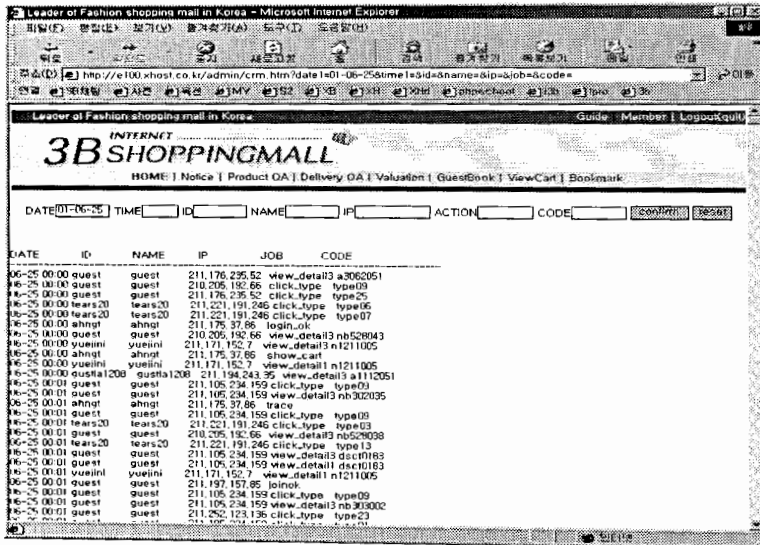


Figure 7: User Log Screen

## User Analysis

Figure 7 shows tasks that a particular buyer has done in the website. This profile is a basis of the learning process for the neural nets and can be converted into the purchasing pattern.

DATE	ID	NAME	IP	CODE
85-05-00	quest	quest	211.171.171.171	www.detail1.nh52984
85-05-00	quest	quest	211.171.171.171	www.detail1.nh52984
85-05-00	quest	quest	211.171.171.171	www.detail1.nh52984
85-05-00	quest	quest	211.171.171.171	www.detail1.nh52984
85-05-00	quest	quest	211.171.171.171	www.detail1.nh52984
85-05-00	quest	quest	211.171.171.171	www.detail1.nh52984
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85-05-00	quest	quest	211.171.171.171	www.detail1.nh52984
85-05-00	quest	quest	211.171.171.171	www.detail1.nh52984
85-05-00	quest	quest	211.171.171.171	www.detail1.nh52984
85-05-00	quest	quest	211.171.171.171	www.detail1.nh52984

Figure 8: User Behavior Screen

In figure 8, in order for sellers to examine buyer's purchasing preferences, the data is retrieved from the buyer record database and the buyer analysis database. This data will be used to test the hypotheses of the buyers' preferences.

DATE	ID	NAME	IP	CODE
85-05-06	yusm1	yusm1	211.171.171.171	order.nh52984
85-05-06	ihsonylh4	ihsonylh4	211.171.171.171	order.nh52984
85-05-06	ihsonylh4	ihsonylh4	211.171.171.171	order.nh52984
85-05-07	yusm1	yusm1	211.171.171.171	order.nh52984
85-05-07	ihsonylh4	ihsonylh4	211.171.171.171	order.nh52984
85-05-08	yusm1	yusm1	211.171.171.171	order.nh52984
85-05-08	quest	quest	211.171.171.171	order.nh52984
85-05-08	yusm1	yusm1	211.171.171.171	order.nh52984
85-05-09	quest	quest	211.171.171.171	order.nh52984
85-05-09	quest	quest	211.171.171.171	order.nh52984
85-05-09	quest	quest	211.171.171.171	order.nh52984
85-05-09	quest	quest	211.171.171.171	order.nh52984
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85-05-09	quest	quest	211.171.171.171	order.nh52984
85-05-09	quest	quest	211.171.171.171	order.nh52984
85-05-09	quest	quest	211.171.171.171	order.nh52984
85-05-09	quest	quest	211.171.171.171	order.nh52984
85-05-09	quest	quest	211.171.171.171	order.nh52984
85-05-09	quest	quest	211.171.171.171	order.nh52984

Figure 9: Order Analysis Screen

For example, a recent one month data for a particular buyer can be retrieved from the database and sorted out in time, product name basis, and then weights are calculated and finally reflected into the buyer variable. Tables 1 and 2 show codes for analysis of purchasing pattern and buyer preferences.

**Table 1: Buyer Profile Code**

	Field Name	Field Code	Value
General	Product-Code	Code	20 (character)
	Product-Name	Name	40 (character)
	Price	Price	1~ 99999
	Manufacturer	Prod	1 ~ 99999
	After Sale Service	As	1 ~ 99999
	Registered Date	Date	dd-mm-yy
	Warranty	Warr	50 char
Age	Teen	Age1	10 ~ 19
	Twenty-Early	Age2	20 ~ 24
	Twenty-Late	Age3	25 ~ 29
	Thirty	Age4	30 ~ 39
	Forty	Age5	40 ~ 49
	About Fifty	Age6	50 ~ 99
Preferences	Formal	Pt1	1 ~ 5
	Casual	Pt2	1 ~ 5
	Traditional	Pt3	1 ~ 5
	Modern	Pt4	1 ~ 5
	Color	Pt5	1 ~ 5
	Design	Pt6	1 ~ 5
	Fashion	Pt7	1 ~ 5

**Table 2: Buyer Behavior Analysis Code**

	Field Name	Field Code	Value
General	Buyer Code	Code	20(character)
	Name	Name	40(character)
	Sex	Sex	1 ~ 2
	Age	Age	1 ~ 99
	Occupation	Job	30 char
	Address	Addr	50 char
	Phone	Phone	13 char
	Marital-Status	Ma	1 ~ 2
	Hobby	Hob	30 char
	Preferences	Buying Score	Buying Count
Formal	Pt1 (1 ~ 5)	Ps1 (0 ~ 99999)	Pc1 (0 ~ 99999)
Casual	Pt2 (1 ~ 5)	Ps2 (0 ~ 99999)	Pc2 (0 ~ 99999)
Traditional	Pt3 (1 ~ 5)	Ps3 (0 ~ 99999)	Pc3 (0 ~ 99999)
Modern	Pt4 (1 ~ 5)	Ps4 (0 ~ 99999)	Pc4 (0 ~ 99999)
Color	Pt5 (1 ~ 5)	Ps5 (0 ~ 99999)	Pc5 (0 ~ 99999)
Design	Pt6 (1 ~ 5)	Ps6 (0 ~ 99999)	Pc6 (0 ~ 99999)
Fashion	Pt7 (1 ~ 5)	Ps7 (0 ~ 99999)	Pc7 (0 ~ 99999)

## CONCLUSION

e-Business has created many opportunities in today's internet based society. One of the most critical aspects influencing the success of e-Business is the effective marketing to interact with the buyers. Many agents have been developed to assist buyers in searching websites and making purchase decisions. However, prior research on agents, mainly focusing on buyers' needs, has failed to address the seller's managerial perspectives. Most agents are designed to track the buying path and identify the websites visited to make a final purchase decision while some agents provide a comparison of prices and products details.

Buyers are now well informed, networked, and even more wise in making their purchasing decisions. Therefore, sellers need to provide more personalized services based on systematic analysis of buyer preferences and purchasing pattern. In this regard, this paper demonstrates an implementation of cyber shopping mall using intelligent agents that support analysis of purchasing data and predict purchasing pattern as well as consideration of time constraint. The system appeared to be very successful implementation of agents for enabling sellers to prepare effective marketing strategy by analyzing product selection process and predicting purchase pattern.

Finally, the contribution of this study is that the system proposed in this study provides guidelines for developing cyber shopping mall using intelligent agents for seller's perspectives. For the future research, this study might need to be extended to utilize data mining approach to analyze very large data set and explore the possibility of web-housing to manage various aspects of purchase knowledge.

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# Benefits from e-Business Implementations with ERP: Exploring the Antecedents of B2B Models

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## ABSTRACT

*The paper reports on the research carried out in 1999-2000 on the use of e-business applications in SAP-based organisations. These early adopters of e-business applications show a trend towards costs reduction benefits from e-procurement, e-store, and employee self-service applications. A structured interview-based vehicle was used to collect data on a variety of established organisations from a diverse range of industries. The findings are analysed according to the level of sophistication of e-business models. Two case studies of early e-business integration with a global supplier and its corporate customers are analysed in the context of the business-to-business model. Collectively, the set of case studies is used to demonstrate the effects of increase benefits stream from an e-business architecture based on a network of ERP enabled organisations.*

*Keywords: e-Business, B2B models, e-ERP implementation, SAP-based organisations.*

## INTRODUCTION

Like all information technologies, enterprise resource planning ERP technology has been profoundly influenced and transformed by the Internet. Less than two years ago, the ERP paradigm was largely confined within the walls of the traditional business enterprise. The current Internet trends serve to extend the original value proposition of ERPs, by breaking down organisational barriers. Now those boundaries have become almost obsolete. In the future, the structure of such organisations will be more like the web (Larsen 2000). Internet technologies offer an ERP based organisation the opportunity to build interactive relationships with its business partners, by improved efficiencies and extended reach, at a very low cost (Hesterbrink 1999). Organisations that fail to seize this opportunity become vulnerable, if rivals establish themselves first in the electronic marketplace. They may eventually be forced to participate in Internet commerce by competitors, customers or end-consumers.

This paper examines the benefits derived from the use of e-business applications with ERP systems. The early adopters of e-business applications show an initial trend towards realizing the benefits from e-procurement, e-storefront and employee self-service. *Statoil* expects savings of 30% from a 2b US\$ annual purchases bill; *Novartis* has reduced the time to fill an order from 10 to less than 3 days; *UBS* Banking has an intranet for the internal organization of its multinationals business for its 40,000 employees; *Scitec* expects 25% of sales from its e-shopping mall.

The paper reports on the findings from the first phase of a longitudinal multi-case study of ERP enabled organisations that pioneered the use e-business (e-ERP) applications. The paper reports on the research carried out in 1999-2000 on the use of e-business applications in SAP-based organisations. The objective is to identify the benefits and problems encountered by the early adopters of e-business applications with ERP according to a framework of e-business models. A semi-structured interview questionnaire was used to collect data on a variety of established organisations from a diverse range of industries. The findings are analysed according to the stages of sophistication of e-business interaction model. The early adopters of e-business applications show a trend towards realizing benefits from e-procurement and employee self-service applications. A case study of the first B2B e-business integration with a global computer supplier and its largest corporate customer is used to demonstrate a more complex model of inter-organisational integration of ERP. The specific goal is to demonstrate the benefits stream from an ERP-based c-

business project. Finally the study is used to emphasize the added benefits from the adoption of inter-organisation e-business solutions.

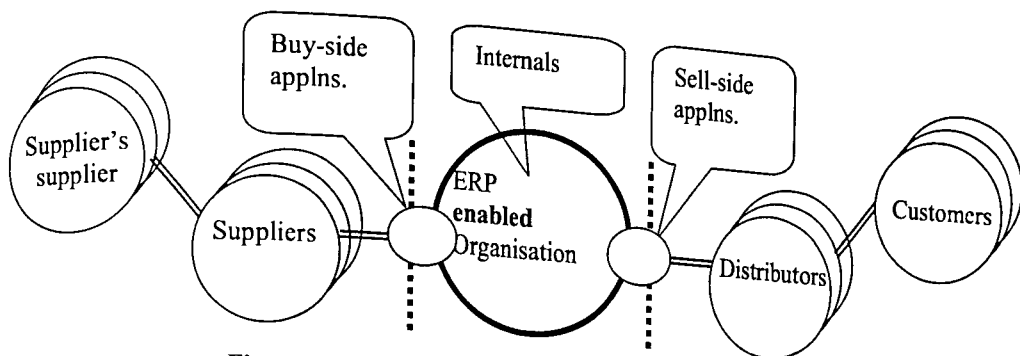
## E-ERP IMPLEMENTATIONS

To achieve the maximum level of benefits from integrating an e-business application with an ERP package, it is important to understand from the outset the complementary nature of an e-ERP implementation. The stakeholders of an ERP system are potentially every employee in the company as well as key suppliers and customers. Typically, an ERP system in its final rollout will replace the majority of legacy systems, and interface with the remaining systems. To the outside world however, the ERP system will be largely transparent, as it communicates with suppliers and vendors using traditional media or standard EDI transactions.

An e-business implementation is from the onset aimed at integrating business processes with outside business partners and is built on and supported by the ERP foundation. The main focus of the implementation will therefore be the integration of cross-company value chains using e-business tools (Kalakota 1999). An ERP implementation has a defined lifecycle, typically 12-24 months depending on the scope and other parameters (Blain, 1999). After the initial implementation, upgrade and functional enhancement projects follow in irregular intervals. e-Business implementations need to be significantly faster than initial ERP implementations (Hesterbrink 1999). However it can be expected that these activities will continue on an ongoing basis to accommodate changing relationships with business partners and enhanced functional and technical scope of existing relationships.

The importance of combining ERP packages with the Internet has a two-way benefit and return on investment. 'Once Internet technology is efficiently integrated into the internal operation, its effective use for external interactions becomes a natural and easy extension. Without the internal infrastructure, external interactions will always be strained and limited' (Telleen 1996). Also, the coupling of these technologies is seen as 'a shift from the traditional emphasis on transaction processing, integrated logistics and workflows to systems that support competencies for communications building, people networks, and on-the-job learning' (Manville 1997).

Although these technologies have distinctly different functions, integrated they offer a sound infrastructure for doing business on-line (e-business) (Venkatraman et al. 1998). Here e-business means 'making the key business processes of an organisation available over the Internet' (Boey 1999). Although simple, this definition nevertheless incorporates some subtle but key points about e-business applications with an ERP system. The primary beneficiaries of this e-business infrastructure are business partners (customers and suppliers). Figure 1 illustrates how these concepts relate to the business-to-business (B2B) models that form the major part a larger class of business models that also includes business-to-consumer (B2C)).



**Figure 1: B2B Model of a Single ERP enabled Organisation for doing e-Business**  
 (Source: Observations from case studies interviewed, Nov 1999)

Figure 1 represents a B2B e-business model that has its roots in EDI supply chain management (SCM). The model describes a *single* organisation that has key internal processes inter-connected to the internal processes of the network of partner organisations; customers, distributors, and suppliers. This is in keeping with the above definition of e-business, where Internet technology (in various forms) is viewed as the enabler of e-business. An e-business application is the software component that links an organisation's ERP processes with a partner organisation's internal system. SAP's B2B e-Procurement is an example of a 'buy-side' application that links to a supplier's catalogues (SAP 1999).

### Early Investigation of Australian SAP Sites

In February 1999, five Australian SAP-based organisations were contacted with a view to gathering information about the status of e-business developments within ERP environments. Significantly, SAP's R/3 system dominates the local ERP landscape. A structured interview approach using open-end questions was used to capture information of current and future use of R/3 with Internet technology. In constructing an appropriate open-ended interview questionnaire, the issue of benefit maximisation was paramount, and the focus of this was towards supply chain automation based around various business-to-business models/principles.

**Table 1: Expected Use of Internet with SAP - Interviewed February 1999**

# Case Alias	Industry	'Business-to' Models
Date of Interview		Comments from interviews
1. Alumina.com.au 13-Feb-99	Mining	<b>B2B</b> – business-to-suppliers (b2s): Company uses the Inbound side, but needs Outbound side or business-to-customer (b2c).
2. Petrol.com.au 12-Feb-99	Oil & Gas	<b>B2B</b> – business-to-business partners Procurement and logistics, access to supplier's catalogues.
3. Service.gov.au 11-Feb-99	Gov. Service	<b>B2E</b> – business-to-employees Intranet with SAP for employee-self-service HR business
4. Society.com.au 24-Sep-98	Retail	<b>B2C</b> – business-to-consumer Extension of business processes with Internet mailings and orders.
5. Utility.gov.au 12-Feb-99	Gov Utility	<b>B2G</b> – business-to-government Attempting payment on delivery for contractual arrangements.

In general, the responses from IT project managers interviewed revealed views and expectations of future developments similar to the key findings of the Norton Nolan Institute Australian industry based study, (NNI 1998):

- Integration across the entire organisation is the key to large efficiency gains;
- Transparency of implementation and changing process is important, both in terms of acceptance of the change and achieving the expected efficiency gains;
- Distinguish between striving to win new markets or customers and achieving cost reductions;
- Develop a benefits register and measure achievements against it.

These preliminary findings match those of the NNI Report (1998), where the actual benefits achieved from adopting e-business solutions have proved very disappointing. 'The largest gaps between expected and actual



benefits are related to supply chain, product development and customer service'. It is in these areas of business practice where ERP systems are regarded as being traditionally strong. The variety of models identified in Table 1, suggests a classification scheme for business interactions of an organisations as; B2B (business partners), B2C (consumers), as well as B2E (employees).

#### Industry Projections of B2B and B2C Models

**Table 2: Comparison of \$Values for B2B and B2C in Year 2000**

Yr 2000	million \$	% B2C	million \$	% B2B	B2B : B2C
North America	40.48	75.9%	468.79	77.6%	<b>11.58</b>
Asia & Pacific	3.81	7.1%	49.89	8.3%	<b>13.09</b>
Western Europe	8.54	16.0%	78.82	13.1%	<b>9.23</b>
Latin America	0.25	0.5%	3.32	0.5%	<b>13.09</b>
Africa & Middle East	0.15	0.3%	2.00	0.3%	<b>13.09</b>
Eastern Europe	0.07	0.1%	0.90	0.1%	<b>13.09</b>
<b>Total</b>	<b>53.31</b>	<b>100.0%</b>	<b>603.72</b>	<b>100.0%</b>	<b>11.32</b>

**Ratio B2B: B2C for Year 2000 ~ 11:1**  
(Source: Forrester 2000)

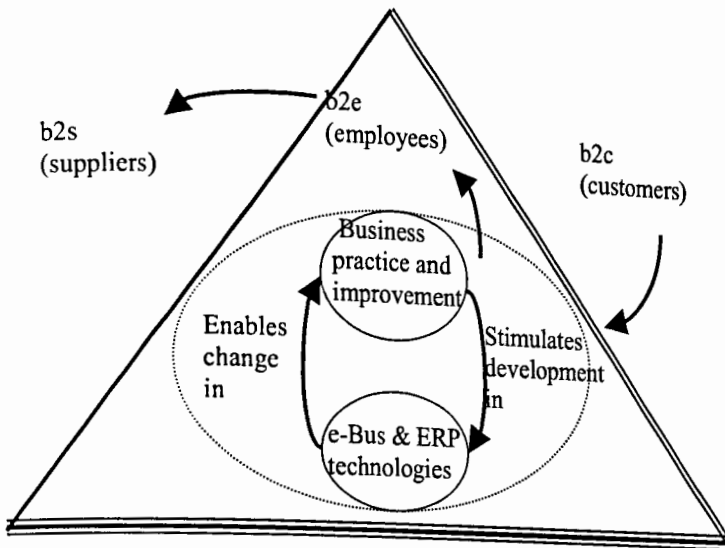
Table 2 shows the worldwide estimates for the dollar value of business-to-consumer (B2C) and B2B transactions (Forrester Research 2000). Specifically the last column shows the ratio of B2B:B2C as a coarse measure of their relative value to the organisation. B2B is at least eleven (11) times the dollar value of B2C transactions for year 2000. According to Forrester Research, the industry projections expect the dollar value in online transactions in the B2B and B2C sectors will be billion \$ 6.3 and billion \$ 0.4, by 2004. In addition the ratio of B2B: B2C will have increased to 14. This has significant implications for traditional business with respect to future opportunities IT investment (ROI) in B2B sector of the economy.

For the rest of the paper, we will discard B2C consumer models and focus on the class of B2B models.

## METHODOLOGY

In November 1999, eleven (11) SAP-based organisations were contacted with a view to gathering information about their use of SAP R/3, and in particular developments in Internet integration with their ongoing R/3 systems. To identify the sites, a search using secondary literature, web sites, and SAP related industry consultants were contacted to identify major e-ERP projects. Within the scope of this study the term e-ERP application is used to represent any instance of Internet-SAP technology adoption (eg SAP B2B Procurement, SAP Employee Self Service, SAP Retail Store), (SAP 1999).

The primary beneficiaries of this e-business infrastructure are, business partners (corporate customers and suppliers) and employees. Figure 2 illustrates how these concepts relate to the variety of business-to-business (B2B) sub-models; b2s, b2c, and b2e (Ash et al. 1999).



**Figure 2: Developments in e-ERP and Business Practice for doing e-Business**  
 (Source: Adapted from Ash and Rossouw 1999)

The findings of the preliminary investigation of established SAP sites are presented by the categories of the three B2B sub-models (Figure 2):

- Business-to-Business (b2s) to support supply chain management between partner organisations.
- Business-to-Customer (b2c) to develop customer interaction, via the Web.
- Business-to-Employee (b2e) to harness the flow/sharing of corporate information, via intranets.

Eleven SAP enabled organisations known to have implemented e-business applications with ERP were selected. In each case a senior IT/SAP project manager was contacted for the purpose of conducting an interview. Table 3 summarises the profiles of six of (11) case organisations that participated in the study. The 'e-business initiatives' selection criteria insisted each e-business implementation was to have significant organisational implications.

**Table 3: Classification of B2B Cases into Sub-classes**

B2B Automation	Case Alias*	B2B Sub-class	e-Business example	No. of Users
Single ERP	1. Biotec.com & 2. Pharma.com 3. O&Gas.com	b2s b2s/b2e	e-Procurement of pharma/chemicals for core business e-Procurement as first stage of b2e and e-Marketplace	~240 research staff ~22,000 & admin ~18,000
	4. Media.com	b2s/b2e	e-Procurement as first stage of global e-commerce for B2C	~28,000
	ERP to ERP	5. Computer.com (linked to) Electronic.com	b2c & b2s	B2B integration of 2 USA partners using EAI-to-ERP infrastructure
			~9,000	
Network of ERPs	6. Scitec.com (cross-divisional)	b2s & b2c	e-Buy across Divisions of a global conglomerate, extended to e-Sell across a network of Divisions	~30,000

\* 6 Cases spanning 5 industry types, and ordered by increasing level of B2B automation  
e-Bus with SAP Sites – Interviewed Nov 1999 and June 2000

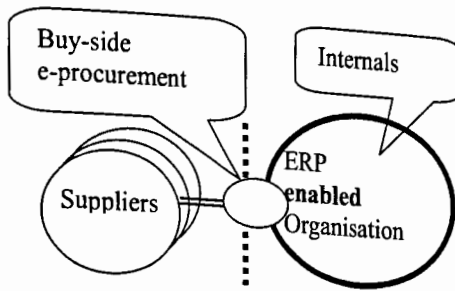
This study was an exploratory investigation into the benefits from extending enterprise wide business systems beyond the organisation. More than ten SAP enabled organisations, known to have adopted e-business systems, were selected. The IT managers were interviewed to obtain a basic insight into each organisation's status of the use of Internet technology (web, intranets, extranets, and e-mail). They were questioned about 'the benefits and barriers arising from extending their R/3 business processes onto the Internet'. The questions were presented within the three sub-classes of the B2B interaction model (Figure 2).

## FINDINGS

The findings are analysed according to the stages of sophistication of the e-business model. An e-Business implementation is from the onset aimed at integrating business processes with outside business partners and is built on and supported by the ERP foundation. An organisation that commits itself to enterprise resource planning (ERP), will inevitably need to extend its system towards a web-based architecture. In doing so the issue of benefit maximisation becomes paramount and the focus of this will be supply chain automation based around business-to-business models.

The findings of all case studies profiled in Table 3 are presented according to the business interactions model classification; b2s, b2c, and b2e. Within each classification the cases are presented in order of increasing e-business application sophistication. Further, the level of B2B automation is supported by an increasing complexity of ERP systems (Table 3).

## B2B INTEGRATION FROM A SINGLE ERP ENABLED ORGANISATION



**Figure 3: b2s Model of a Single ERP enabled Organisation for e-Procurement from Suppliers**  
(Source: Observations from case studies interviewed, Nov 1999)

The case studies profiled in Table 4 demonstrate the use of e-business 'buy-side' applications. This category of application links a company's ERP to a supplier's catalogues, eg SAP's e-Procurement. It represents the earliest stage of an e-business implementation with ERP. The motivation for these developments or business driver is cost reductions from efficiency gains.

**Table 4: Case Study of 'b2s' projects**

Case Alias	Orgn. Size	c-Business Project Title	No. of Users	Country
1. Biotec.com & 2. Pharma.com	Medium	Staff research procurement	200	UK
3. O&Gas.com	Global	Sales Order Rapid Delivery	3,000 +	Switzerland
4. Media.com	Large	Staff travel procurement	10,000 +	Norway
	Global	Simple Ordering e-catalogue	9,000 +	Germany

Key: Small < 100, Medium < 1000, Large (national), Global (multi-national)  
'b2s' as e-Procurement for Shorter lead times and Lower costs

The cases in Table 4 are implementations of desktop procurement system (DPS) designed for the non-professional procurement staff (Segev et al. 2001). The focus is an indirect procurement function that includes maintenance, repair, and operating (MRO) supplies. It brings into play the issue of employee self service (ESS) that includes retraining for this change in roles.

With SAP B2B Procurement e-business solution, *Biotec* reported that 'lead times to fill an order were shaved down from four to just one day – from the point in time when an employee identifies an order, to actual delivery'. Having achieved shorter lead times, *Biotec* no longer needs to keep large stocks of materials, so expenditures are down and cash flow is healthier. Indeed, the company expects to save between ten and 15 percent on the cost of purchasing materials. Another goal of the business-to-business project was to build more long-term links with preferred vendors. So far, *Biotec* has identified three such vendors. Their Internet sites were linked into the SAP procurement system, allowing *Biotec* staff to use e-procurement on the company's own intranet and to purchase from both the internal catalogue and external online catalogues. This was made possible by a specially developed open catalogue interface. The procurement department already attributes one major success to its new procurement process: It has been able to increase the discounts previously offered by its three preferred vendors a further five percent (15% overall). But the benefits are by no means all one-sided. SAP B2B Procurement gives vendors plenty of opportunities, such as direct ordering. All three companies believe future benefits will come from industry portals, eg Chemicals and Oil and Gas.

To maximise the benefits, the notion of fast e-business adoption was emphasised. 'Roll-out of the e-business solutions needs to be achieved very quickly for ROI'. Also, there needs to be 'full cooperation between industry partners'. 'Collaboration between suppliers, to standardise item numbers in catalogues'. Further, 'it is only with content that you gain a win-win, eg industry catalogues. This implies the importance of the B2B value chain'. Finally, to make use of SAP's industry portal ([mySAP.com](http://mySAP.com)) requires 'organisational culture is in the right place'.

To minimise the barriers (eg resistance to change), all suggestions were concerned with technical or more practical issues. This appears to have been provoked by an IT driven project mindset. The procurement applications need to be much more user friendly. We recommended, 'an upgrade to Web-enabled SAP R/3 4.6' and 'an increase in business application program interfaces (BAPIs)'.

In the future, all three organisations believe their ERP technology will play an integral part in helping these established enterprises build and operate online business-to-business models. In particular, the B2B e-procurement developments could lead to industry specific or private e-marketplaces.

**'b2e' as Employee Self Service for an improve efficiency of work life**

Cases 3 and 4 from different industries, implemented organisational intranets that combined with their SAP R/3 business processes. These solutions were easy to deploy while offering significant benefits from networking employees. *Media.com* implemented the SAP Internet solution for internal address management. It covers all organisational information within its global network and is the most-used Web application, available for 9,000+ employees, with 150,000 transaction calls per day. It also implemented its own Intranet integrated with R/3 to facilitate the networking of the staff in preparation of E-commerce (B2C). 'This is a generic back-office solution, not a SAP industry solution, to save time and paper for the distribution of staff information'. It offers transparent access to important policy manuals and procedure documents across all departments. 'It also offers collective use of many functions' (Perez et al. 1999: 49).

A leader in media sales and services world wide, *Media.com* implemented SAP Internet solutions to enable it 'to further leverage its investment in its SAP system by extending the functionality of the R/3 system to casual users'. This global integration strategy by networking the enterprise is viewed as 'e-commerce survival'. A change management team was commissioned to achieve this end. The numerous requests from various profit centres within the group for similar solutions showed a high level of acceptance from the user communities.

To maximise benefits, the design of intranet interface has to accommodate the least trained employees. Requires concerted corporate focus. Managers and IT staff must learn together (fast) to seek new business models. 'We need to develop our Intranet system as a *learning* system.'

To minimise barriers, increase the availability of supplier catalogues, collaboration between suppliers, and to standardise item numbers in catalogues. A greater range of application interfaces would reduce the cost of linking SAP data to the Internet. SAP needs to understand the Media business. 'We need to understand the environmental factors including IT infrastructure.' Corporate paranoia is in the minds of managers and consultants. Change management needs to be addressed and practiced.

**Table 5: Case Study of 'b2c' linked with 'b2s' projects**

CASE ALIAS	Size	Country	B2B Sub-class	Project Title	Users
5a. Computer.com (linked to)	Large	USA	b2c (linked to)	Customised online sales	~27,000
5b. Customer.com	Large	USA	b2s	Staff MRO procurement	~14,000
6. Scitec.com	Global network	UK	b2c + b2s	Sell-side System to e-Mall to Gatecentre (e-Marketplace)	~40,000

Key: Small < 100, Medium < 1000, Large (national), Global (multi-national)

## B2B Integration Between a Supplier and a Customer Organisation

The two case studies profiled in Table 5 demonstrate the application of B2B integration between the ERP systems of multiple organisations. In figure 4 the e-business applications link two organisation's ERP systems into a fully integrated corporate customer-supplier relationship or SCM system.

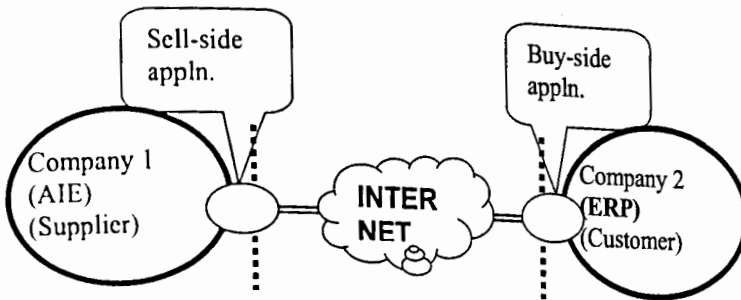


Figure 4: B2B Model of a Supplier linked to a Customer  
(Source: Modelled from case studies, interviewed June 2000)

## B2B Integration of ERP systems of two Companies for Complementary Benefits

In 2000 *Computer.com* pioneered (implemented) its first business-to-business 'B2B e-Business Integration' with one of its largest customers (*Customer.com*). This case illustrates a first stage system architecture to inter-enterprise computing. In this example, the integration of the system architecture is made possible through a variety of 'back-end', 'sell-side' and 'buy-side' systems.

*Customer.com* was able to leverage its existing SAP 'back-end' system and SAP Business Connector (powered webMethods technology) to communicate directly with *Computer.com*'s component-based e-business system. The integration of *Customer.com*'s ERP (SAP R/3) system and (SAP B2B) procurement application to *Computer.com*'s Web catalogues, automates the e-procurement of all computer products from via the Internet (Dell 2000).

### B2B Integration of a Network of ERP-based Companies (Divisions)

#### Stage 1 'b2c' Computer Sales to other Divisions and Corporate Customers

The SAP-based **Order and Request System (ORS)** was developed in 1997 initial for *Scitec Computer Systems* (company division), for use all over Europe. In addition to standard features such as the ability to browse a catalogue, collect items in a shopping cart, and place an order, ORS provides the following capabilities: The system was developed to optimise processes between *Scitec Computers* and its other divisions. Some 80% of orders from 2200 key accounts are handled by the e-ordering system. Also, there was reasonable acceptance by the end-users, with less order errors aided by the reliability of SAP R/3 data.

#### Stage 2 'b2c' Sales across Divisions

In 1999 the *Scitec e-Mall* was developed as an Internet marketplace for *Scitec* divisions to sell their products and services to business customers. The system architecture has the capability to connect/interact with a range of 'Buyer' companies SAP R/3 and R/2 systems, and other ERP systems. By June 2000, the company's e-Mall had progressed to version 2 with three companies - ICP, A & D, Medical. The intended benefits of e-Mall flow from the streamlining of sell-side business processes:

Scitec group specific product presentation;  
Integration of Group's materials systems;  
"One face" to the customer;  
Sales presence round the clock and world-wide.

### **Stage 3P: 'b2s' Procurement across Divisions**

The Scitec Gatecentre is an electronic marketplace for Scitec' companies to purchase their products and services from business suppliers. The worldwide presence of the Scitec purchasing network supports global sourcing and corporate-wide combined requirements. Scitec has 520 purchasing departments globally. The intended benefits of Gatecentre flow from the streamlining of buy-side business or procurement processes:

Individualised offers  
Up to date cross group Scitec offerings  
Convenient ordering at any time and anywhere.

The potential for procurement was characterized/defined by the company focus on cost-reduction. This was assessed in terms of procurement marketing and procurement logistics:

Procurement Marketing – strategic cost-reduction through;  
global sourcing,  
market transparency,  
supplier management and demand bundling.

Procurement Logistics – operative cost-reduction through;  
standard procurement processes,  
optimisation of time, costs, and quality.

### **Outcomes and Performance Gains**

Table 6 summaries the similarities and differences of the expected benefits from the two cases about business networks. However, within the issue of performance gains, improved customer response and an expanding customer base was seen as most significant factor. As a measure of its success and acceptance, future e-business solutions are expected to include the employee self-service of B2B e-procurement of office equipment and supplies.

The performance gains for e-procurement were achieved from two sources; 25% cost savings, and reduced cycle time from 2 weeks to 2 days, and access to (real-time) customer data via ERP technology. The project enabled efficiency gains from minimising of delays in customer orders, and effectiveness gains from optimising employee/staff time. For example; fewer complaints, improved management of the customer, increase to 50% with online orders (sales), and a growth in corporate sale of 45% (DELL 2000). Also, online access to real-time data for deciding on the optimal employee orders. The cost savings through operational efficiencies of all equipment purchases, compare favourably to those cost reductions in other e-procurement case studies. In the *Biotech.com* case study, the gains appear to be less; 20% cost savings, and reduced cycle time from 2 weeks to 4 days. However, the improvement in administrative efficiencies for staff, appear the same.

**Table 6: Integrated Enterprise Systems Scorecard**

	Computer.com	Scitec.com
Orgn. Benefits	Presentation of configurable products on the Internet Control and standardize procurement process Increase order accuracy and efficiency Reduced order cycle times Provides a model for use with all customers with SAP	Presentation of configurable products on the Internet Ordering times optimised through online connection Incorrect orders reduced to minimum Shorter and therefore faster ordering times Information management
Partner Benefits	Available 24 hours a day, 7 days/wk. Simpler ordering, resulting in savings in cost and time Automatic online information on order changes and delivery acknowledgements Extend existing infrastructure to the web for use by our suppliers	Available 24 hours a day, 7 days/wk. Simpler ordering, resulting in savings in cost and time Automatic online information on order changes and delivery notifications Tracking of orders at any time

In addition to the benefits from e-business implementations (Table 6), ERP imposes a discipline of best practice (however rigid) to internal business processes, eg order a stock item from a supplier. Such constraint offers integrity of data/information that external users find attractive and potentially trustworthy. Web-enabled applications with ERP were found to offer important business options for existing ERP enabled organisations with B2B models; a more flexible and agile IT architecture for e-engineering of business networks.

## CONCLUSIONS

The early adopters of e-business applications show a trend towards realizing benefits from e-procurement and employee self-service applications. Standardisation of both business processes and vendor catalogues is a way to drive cost reductions in supply chain management. A further case study of the first B2B e-business integration with a global computer supplier and its largest corporate customer is analysis in the context of a more complex model. This case demonstrates the integration of ERP and non-ERP systems, using Web-based technologies, to provide the infrastructure required to optimise the overall B2B value chain. Also, the study is used to emphasize the synergistic benefit stream from B2B integration, the automation of inter-organisation e-business solutions.

Overall, the results from the case studies demonstrated that three divisions of a business-to-business interaction model (b2s, b2c, and b2e) provide a framework for studying e-business benefits. While this research found an important role for ERP in support of e-business, the message from these case studies is that the business model should drive an e-business implementation, not the technology.

As business thinking shifts from cost saving to revenue generation, this research framework is commended as a research tool, for future study of the broad and new complex phenomenon of e-ERP implementations. A candidate subject for future research is e-business in ERP environments as a composite strategy (Figure 2). The evidence thus far indicates that ERP technology will continue play an integral part in helping established enterprises build and operate online business-to-business that can lead to electronic marketplaces. Thus there is a need to redirect this study towards investigating those SAP sites that had implemented mySAP.com, SAP's portal for e-business solutions.

More recently, organisations that have begun to undertake e-business initiatives to meet strategic goals, recognise that they will only accomplish their objectives through people. Therefore placing importance on improving the quality of work-life issues. If effectively managed, employees should ultimately be more productive in their work tasks and better able to serve customers, suppliers, and business partners. The key performance improvements issues are; efficient company resourcing, quality of employee work life, and customer satisfaction (Venkatraman et al. 1998).



Finally; *technology* is important, *business-to-business models* are more important, but; *people* have to make them work.

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# A BYTE OF PREVENTION IS WORTH A TERABYTE OF REMEDY

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## ABSTRACT

*We monitor phone line usage and bar long distance calling on the most common modern communication device the telephone to maximise business benefits yet we are reluctant to apply the same scrutiny to our Internet connections. Common catch cries abound, such as "we don't know how to do it" or "there is no way we can stop it entirely". While these are all valid arguments they are not a valid excuse to not regulate use of your Internet connection. If institutions regulate their phone systems to keep costs down and ensure that the technology is used appropriately why then does it not follow that Internet connections are treated the same.*

*This paper outlines some of the risks than an unfettered connection to the Internet can present for modern organisations. It then provides some steps that an organisation can undertake to start reducing risks and costs associated with their Internet connection.*

*Keywords: Internet, risk, bandwidth, cost, monitoring*

## INTRODUCTION

As the use of the Internet becomes more ubiquitous and widespread in business the threats and risks associated with its abuse are increasing. We now have over 45% percent of Australians who access the worldwide web doing so at work (McLennan, 2000). So what measures can be put in the workplace to monitor this employee activity. We have established controls and measures in existence for other information communications technologies such as the phone and fax but what do organisations have in place for their web and e-mail traffic?

The optimal performance of a company's network infrastructure is an integral part of any modern business's productivity. The indiscriminate sending of e-mails, accessing MP3 audio files or video files and other non-business related materials could cause delays and slow down or even halt the network for legitimate business use. Employees are increasingly legitimately using e-mail to share large data files such as spreadsheets, graphics, reports and other business documents. This is starting to push often-scant bandwidth availability to breaking point, which is only further exacerbated by the illegitimate use of the Internet connection.

Recent surveys have figures between 60-80% of employees accessing pornographic material in the workplace (Hickins, 1999) and as well most staff are sending private e-mails (Holtz, 2001). So why is this problematic? Several factors make this problematic firstly, there is the lost productivity of the worker who is carrying out these activities. Secondly, the use of resources for reasons other than which they were deployed and finally the legal and social implications of such use in the modern workplace.

Many institutions do not even have established network policies and procedures to cope with normal network access requirements let alone the extended access into the Internet. Some organisations are deploying policies and filtering systems to counteract some of threats and risks that this access to the Internet poses to the organisation. However, the effectiveness of filtering systems alone is proving ineffectual in some cases to preventing this sort of abuse (Hunter, 2000; Neumann & Weinstein, 1999; Nunberg, 2001).

This paper will present a combination of policy and effective countermeasures to reduce the risk posed by such unauthorised and unsupervised of the Internet in most organisations.

## **WHY FILTER AND POLICE?**

Most organisations that are connected to Internet have expended considerable amounts of capital and resource to provide and maintain the connection. After the initial provision of the server infrastructure typically the next biggest cost is the ongoing provision of the bandwidth which overtime can easily outstrip the initial capital cost of the physical infrastructure. So finding methods that reduce the unnecessary use of the bandwidth is imperative if costs are to be minimised and controlled.

One of the biggest areas of concern is also the workplace and legal issues that arise from employees misuse of the Internet. The range of issues that these present is wide, varied, and problematic.

"Insiders pose enormous legal dilemmas for their employers who have to decide how to deal with the threats or harm arising from computer misuse.....Vicarious liabilities which might be attached to employers for the acts of their employees in the course of their employment and by their usage of the new technologies, have in the main been one of the biggest concerns and worries of employers."(Zaiton, 2000)

The legal aspects of this are not intended to be covered in any great depth in this paper. But we must acknowledge that unfettered access to the Internet can leave organisations open to liability and risks that they must attempt to reduce via a set of appropriate countermeasures and policy.

### **Filtering the Noise**

Content filtering is a valid way of controlling access to an organisation's Internet connection. There are very few organisations that need to have legitimate access to websites that would contain explicit pornography, hate literature, slander and libellous material. In the same way that phone lines are barred or monitored why are these same controls often not readily applied to incoming and outgoing web traffic.

While it is a given that most content filtering software does not block every undesirable site it does however, block most of the patently obvious sites. Herein lies one of its understated strengths if an employee does not actively view such materials at home for instance then the possibility that they will know some esoteric URL such <http://203.38.0.163/~hatematerial> is greatly reduced. A naive abuser however, is likely to know obvious brand names such as Playboy or Hustler that would which content filtering software will block. This would then send the appropriate organisational message to the end user. Conversely for the experienced purveyor of such digital material the entry of the esoteric URL's needed to bypass the content filtering software would easily show up in the log files of the proxy server.

For some sites between 10 to 70 percent of bandwidth used to display the page is taken up by extraneous material in the form of advertising banners, animated gifs etc that have very little if any functionality for the viewer. By using filtering techniques to remove most of these advertisements an organisation can increase the "relevant" information carrying capacity of their Internet connection.

Apart from increasing the relevant carrying capacity of the pipe the lack of advertisements and other extraneous click through possibilities should have an impact on user behaviour and productivity.

Bandwidth intensive media such as FTP, MP3 and streaming video long could be likened to a long distance phone call. Unlike web browsing and e-mail which is short bursts of information an FTP or video stream will typically download as fast as your pipe allows for as long as it takes to download that file.

So if there is a 45MB demo file of the latest game waiting at an FTP site and a person in your organisation decides to download it and there are no checks in place that effectively means that the Internet connection will become clogged with this traffic. Regardless of the fact that it has cost the organisation money to download the file there is the opportunity cost of having your Internet connection unable to service legitimate business activities during that time. There is also often the problem of copyright infringement when concerned with things such as the download of MP3 and video files.

## **METHODS AND TOOLS FOR REDUCING RISKS**

Putting policy in place and maybe logging connections is simply not enough to reduce the risks. The question still remains what percentage of the Internet volume is being used for legitimate business purposes? What material is being downloaded? For these questions to be answered ongoing monitoring of the connection is needed. You rarely have to get to specifics but you can see if that suddenly [www.freewhippy.com](http://www.freewhippy.com) is chewing up 30% of bandwidth a day and has no relevance at all to your work. Then simply barring that site will allow you to regain that 30% of bandwidth back without the need for organisational witch hunts and sends a powerful symbolic message to people within the organisation (Brown, 1994; Feldman, 1981).

There are several relatively simple things that network administrators and organisations can do to effectively reduce the risk associated with Internet misuse and abuse. The following is a set of procedures and tools that can be used to help facilitate the correct use of Internet for business purposes.

It is assumed that access to the web is provided by proxy servers and that all connections to the web are provided through these. Likewise all e-mail transgresses through an internal mail server before being routed to the outside world.

### **Policy**

Before anything can really be effected in the organisation it must develop an access policy for the Internet. This sets the bounds and limits for users as to what is reasonable and unreasonable use. The policy should explicitly state what expected of users..

"In order to protect its legitimate interests, the most important action that an employer can take is the development and enforcement of a telecommunications policy. For both legal and practical reasons, all of the rules, rights, and objectives of employer and employee must be clearly stated in the policy. If that is accomplished, an employer will have a great deal more flexibility in handling employee issues." (Thomas, 2000)

This access policy should be overtly apparent to all employees and should be communicated in writing to all employees ideally as part of the employment contract. The policy should also be reviewed at regular intervals to may sure that the policy is still relevant and addresses the needs of the organisation. The policy should be an integral part of the organisation information security approach.

## **Nailing Abusers Down**

Before any site logging can be truly effective there must be a way of uniquely identifying who the person accessing the pages is. There are several ways to accomplish this namely manual user authentication, static IP addresses and automatic user identification.

Manual user authentication normally requires the user to input their password and user name which is often different from the network login name. The user must input this each time they wish to use the proxy server i.e. start their web browser on the client machine. This is problematic as it can cause user disenchantment and frustration, but is also an unproductive and overtly intrusive use of technology.

The best method is the use of static IP addresses and automatic user identification. Automatic user identification involves the inclusion of the user/login name of the system that is accessing the Internet. This is normally done via the network operating system providing the login name to the logging server. It can also be accomplished via the use of public key infrastructure and the use of digital signatures and certificates to seamlessly access the network. Another alternative is the use of identd daemon technology that is freely available for most computer platforms and provides transparently the identity of the logged in user.

A static IP address means that the IP address is used exclusively by that device accessing the network and is set statically i.e. it does not change. Many systems administrators for ease of setup, use and maintenance use dynamically allocated IP addresses via the Dynamic Host Control Protocol (DHCP) suite. This is often problematic when trying to track perpetrators as the IP address of a particular workstation will change over time and hence it can prove difficult to prove a breach.

In the case of e-mail authentication this is automatic as user names and passwords must be provided in order to be able to receive and send e-mail for most systems.

## **Logging It**

Having put in place structures to accurately identify each user on the network the next step is to provide sufficient logging to track the activity of each user. As indicated in the previous section logging of e-mail does not present any difficulty because users normally have to authenticate to use the service.

When logging accesses of the web the log file should as a minimum log the time, the requesting IP address, the requested URL and whether the access was successful. Most modern proxy servers log file formats easily cover all of these requirements for analysis. It is advisable however, to make sure that the logging is enabled and that the log file format does cover the minimum requirements. It is also important and that the logs have sufficient persistence so that a pattern of abuse/misuse can be established.

One overlooked point is that all servers that serve content should have their dates and times set centrally. The originating timestamp should be also sourced and regularly updated from official timeservers on the Internet, which makes analysis simpler and accurate.

## **Log file analysis**

Having successfully captured in the log files the web browser based activity of the organisation some analysis must be conducted. There are a wide range of tools available for the purposes ranging from freeware, shareware offerings right through to full-blown commercial systems costing several thousand dollars.

Systems that provide the ability to graph usages are best as they give managers a quick glance to establish patterns. Most systems can provide highly detailed reports of URL's visited and bandwidth consumed down to specific users or IP addresses if so configured.

Then having processed the logfiles and having this information at their disposal the managers can determine appropriate remedies in-line with established policy.

### **Content filtering**

This is simply the blocking of undesirable sites via either the existing proxy servers or the use of a third party software tool. Whatever method is selected it is important that the rule setting and procedures associated with these mechanisms is constantly reviewed as a result of the ongoing logfile analysis to be the most effective.

The system must allow for the additional customised blocking of sites to be effective. Sites that can start to be problematic may not be blocked by content filtering software as for all intents and purposes the sites are not offensive and are typically used for business purposes. By way of example an external site that is used worldwide for team based sharing of files in one company proved to be a problem. The author who monitored a site for a client upon deeper investigation of a legitimate site had staff transferring large pornographic movies to each other rather than work files the volume of which was around 50-100MB per day. The ability to track this enabled the organisation to reduce network traffic, reduce the risk of hostile workplaces and redress productivity issues.

As mentioned before the removal of advertisements and other extraneous materials can reduce page download sizes by as much as 80-90%. This may seem insignificant when you are saving say 50K a page view. However, if this is a search engine page that gets 1000 accesses a day this represents a bandwidth saving of 50MB a day and at 20c a MB download cost \$10.00 a day or ~ \$3500 a year in bandwidth. This again is facilitated by the monitoring of the network activity in the form of logfile analysis.

### **CONCLUSION**

In the same way organisations monitor and control other communications channels the same measure of diligence and oversight should be applied to an organisations Internet connection. While content filtering and site monitoring have inherent faults in that they will not effectively capture every transgression and may block innocent sites. They do however, provide a valid baseline defensive mechanism for organisations to reduce risks, costs and threats associated with the provision of Internet access in the workplace.

The effective implementation of the content filtering and monitoring program is as much about tools and techniques as it is organisational acceptance and compliance. For content filtering and monitoring to be effective it must become a seamless part of the organisations policy and procedures. Significant cost savings and risk mitigation can be achieved through the effective use of content filtering and monitoring of Internet connections in an organisation.

Internet connected organisations that perceive they are not vulnerable to these problems or cannot simply justify the expense of monitoring software and or organisational procedures to combat non-business use of the Internet should re-think. This practise of e-ignorance is leaving the organisation libel to a range of potential legal risks. Furthermore; it is costing the organisation for every byte of non-business use that in or out of the organisation. So is your organisation "Net wise or byte foolish?"

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# The Adoption and Use of Electronic Banking by SMEs in Australia

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## ABSTRACT

*In the competitive world of commerce SMEs must examine every new enabling technology to not only remain competitive but to stay in business. Information technology is now providing SMEs with basic business tools that will enable them to increase their attention on their core business activities. One activity that can be greatly improved by information technology is electronic banking. In this paper we examine the use and adoption of electronic banking in an Australian context.*

## INTRODUCTION

The ability to reduce the demand on the organisation's operational resources by non-core activities and time spent performing these activities will naturally provide more resources for the production of the organisation's goods and/or services. Moreover, this will improve the organisation's financial performance, efficiency, and its use of the organisation central operational resource and staff members. The largest operational resource found in an organisation is staff time. Similarly, the largest operational overhead for an organisation is staff wages and salaries. The allocation of this organisational resource (staff time) on core and non-core activities is extremely difficult.

In larger organisations staff are allocated to perform non-core activities. These organisations use operational efficiency standards to ensure that staff employed to perform non-core activities work efficiently and see the value of completing non-core activities quickly. In contrast, smaller organisations, i.e., Small to Medium Sized Enterprises (SMEs) do not have the budget to employ staff that can be dedicated to non-core activities nor do many see the benefits of performing these non-core activities efficiently (Longenecker et al. 1998).

One administrative non-core activity that has not received much attention has been the banking function of SMEs. Traditional banking is a resource intensive process. For SMEs, these resources included travelling to and spending time at the bank, generation of cheques, etc. The routine nature of traditional banking allows for information technology to be used to reduce the operational expenses involved with this function. However, SMEs have difficulty identifying the need to use IT within their organisation to reduce non-core business inefficiencies leading to a poor awareness of electronic banking systems (DeLone 1998). The availability of information systems that allow SMEs to complete these activities more efficiently will greatly benefit them.



## AUSTRALIAN SME'S ELECTRONIC BANKING SURVEY DETAILS

Central to this work is the development of an understanding of the current Electronic Banking perceptions and practices by SMEs within the Australia context. This paper focuses on the adoption and use of electronic banking by SMEs. Moreover, we focus on the possible removal of inefficient business processes through the use of IT as a method to assist organisational change. Electronic banking is an IT system that can be used to remove inefficiencies and is being actively promoted by the banking industry. The range of IT systems available to perform banking and SMEs ability to adopt these systems will be explored in detail with an inspection of the possible benefits and problems associated with this use. In detail we will investigate:

- The nature of SMEs who are using electronic banking;
- The nature of SMEs who have not adopted or are considering adopting electronic banking;
- The main impediments of SMEs who have not adopted electronic banking;
- The benefits and problems users of electronic banking are experiencing; and
- The perceptions of Internet banking by all SMEs.

In this paper we use a simple conceptual model to examine the adoption and use of electronic banking by SMEs. The conceptual model of electronic banking was adapted from the EDI adoption for SMEs (Iacovou et al. 1995), as shown in Figure 1. This provides a framework for the development of a survey tool ensuring that appropriate questions were asked to gather the most relevant data possible.

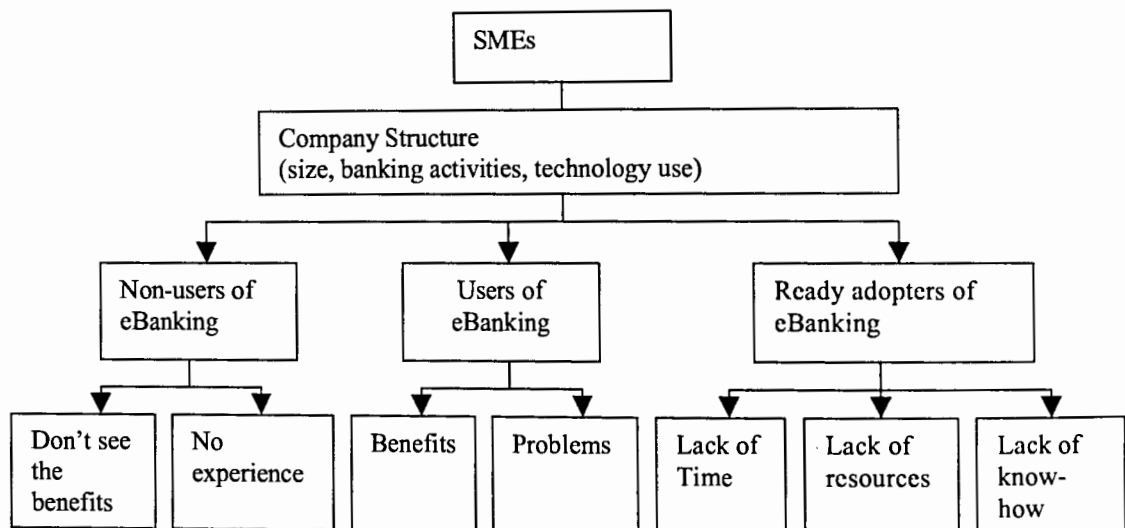


Figure 1: Conceptual model for the adoption and use of electronic banking (Adapted from Iacovou et al. 1995)

### SELECTION OF SURVEY RESPONDENTS — ELECTRONIC BANKING IN SMES

The target group focuses on SMEs from the Geelong region of Victoria, Australia. Selection of SMEs was performed by obtaining a list of all possible organisations, within the Geelong region, from the Geelong Chamber of Commerce (GCC 2000). From the surveys sent a total of 57 surveys from the 66 returned were used in the analysis. From these respondents 24 or 42% of the respondents were from the Textile, Clothing, and Footwear (TCF) industry, 25 or 44% from the automotive industry and 8 or 14% from manufacturing/surfing allied industries. Clearly, with a survey of this size it is not appropriate to generalise the results. Initially the responses were broken into the three industry groups and analysed to determine if any results were industry specific however there were no standout differences between the industries (Cameron 1999). The respondent SMEs were separated into two groups: those currently adopting electronic banking; and those non-adopters of electronic banking.

In total 12 or 21% of SMEs were using electronic banking, 6 or 50% from the TCF industry, 3 or 25% from the Automotive industry and 3 or 25% from other industries. In contrast, 45 or 79% of the respondents did not use electronic banking. Eighteen 18 (75%) respondents from the TCF industry, 22 or 88% of the respondents from the Automotive industry and 5 or 62.5% of the respondents for other industries.

## **SURVEY STRUCTURE OF SME'S ADOPTION AND USE OF ELECTRONIC BANKING**

The model of electronic banking adoption has provided the understanding of how SMEs may be using electronic banking. From this model six sections of the survey tool were established to obtain information from SMEs. The sections were:

- Company profile;
- Banking activity;
- Business use of technology;
- SMEs who use electronic banking;
- SMEs who don't use electronic banking; and
- Perceptions of Internet banking.

### **Company Profile**

The first section of the survey 'company profile' was used to ensure the respondent organisations were SMEs, from the Australian Bureau of Statistics definition (ABS 2000). It also provided information on the industry of the SMEs to allow comparison of industries.

### **Banking Activity**

The second section of the survey was used to obtain information regarding the banking activity of the SMEs. The time to complete their banking weekly, their main banking activities, and how payments are made and received can be used to show benefits for non-users of electronic banking (Carter 1998).

### **Business Use of Technology**

The third section regarded 'technology use' and was used to determine the IT use of respondents and complete the company structure (size, banking activities, and technology) as shown in Figure 2. Knowledge of the IT use enabled analysis between the three types of SMEs, non-users, adopters, and users. The effect of IT use on electronic banking adoption and use could then be established. If the IT use gap exists between trading organisations the effort needed for SMEs who were currently not using electronic banking to start using this technology could be shown. If no gap existed we could be able to dispel lack of technical know how and use impediments of electronic banking, "the relative advantage of technology is an important factor in the adoption of technology by SMEs" (Rogers 1983; Fuller and Jenkins 1995).

### **Business Who Use Electronic Banking**

The fourth section was to be completed by organisations using electronic banking. The time of use of the technology, benefit, and problems associated electronic banking use is determined. The effect time had on electronic banking use could be determined to put benefits and problems into greater perspective than just the association with company structure, as section 2.2.2. SMEs who are ready adopters are eager to understand the benefits electronic banking will offer their organisation (Abell 1996).

## Business Who Not Using Electronic Banking

The fifth section of the survey was to be completed by SMEs not using electronic banking so that information relating to the barriers in using this technology could be found. The SMEs were then asked whether they would use electronic banking. Knowing whether or not they would use electronic banking provided further classification as to the SME being a non-user or ready adopter. For these SMEs their impediments could be determined and analysed with their company structure.

## Perceptions of Internet Banking

The final section examined the 'perceptions of Internet banking' of all respondent SMEs. The Internet is the new enabling technology for electronic banking and it is envisaged that both current users and future users will have to use the Internet to perform their electronic banking (Grayson 1998). Identification of the benefits and risks SMEs associate with the Internet provide greater understanding of the impediments identified in section five.

Category	Classification of SME by Use of IT
Category 1 'Very Low'	Use a computer and / or Use a word processor (Word, MSWrite, etc)
Category 2 'Low'	Category 1 and two of the following: Create invoices using a computer Have a customer database Use an accounting package Have an inventory database
Category 3 'Medium'	Category 1 plus 3-4 of the following Create invoices using a computer Have a customer database Use an accounting package Have access to the web Have an inventory database Have an Electronic Data Interchange (EDI) system
Category 4 'High'	Category 1 plus Create invoices using a computer Have a customer database Use an accounting package Have access to the web Have an inventory database
Category 5 'Very High'	Category 1 plus Create invoices using a computer Have a customer database Use an accounting package Have access to the web Have an inventory database Have an Electronic Data Interchange (EDI) system

Table 1: Categories of SMEs use of technology

## Classification for Respondent SMEs

Technology use was determined to be an important factor in the adoption and use of innovation of within redeveloping business process (Raymond 1985; Iacovou et al. 1995). The benefit of electronic banking adoption and use to SME's business processes is no exception (Cragg and King 1993). To establish the effect technology would have we had developed a classification 5 categories structure of IT use within a SMEs. The breakdown of each of these groups is shown in table 1. SMEs within category 1 have the greatest hurdles to overcome as they either do not own a computer or use their computer for basic tasks, such as word processing. Not only will they have to spend the greatest amount of resources to enable them to use electronic banking they will also require some form of computer training to use this technology. Category 2 SMEs use their computer with a limited number of applications that will benefit these SMEs but do not have access to the Internet where most of electronic banking systems are available. Some SMEs will have an accounting package and will be familiar with using IT systems to assist their banking. Category 3 and 4 SMEs have access to the Internet and would own the hardware components needed to operate electronic banking. Category 3 SMEs will require greater help to use

electronic banking than category 4 SMEs, as they do not have greater depth of IT usage. All SMEs in category 4 have accounting packages and would already benefit from more organised financial data. SMEs within category 5 are in an ideal position to undertake electronic banking as they already use electronic communication mediums to transmit information to other organisations.

### SMEs Using Electronic Banking

From the 12 respondent SMEs using electronic banking we have examined the standout characteristics of these SMEs. As expected the adopters of electronic banking had a "high use" of Information Technology (IT) and high sales volume to fund the technology. Importantly, this work highlighted the advantages of electronic banking use and of course the problems faced by the users of electronic banking. In the remaining sections we have categorised the tables based on the use of information technology based on the system outlined in section 2.2.6. That is the "very low", "low", "medium", "high" and "very high" use of technology.

Do you use ebanking	Very Low	Low	Medium	High	Very High	Total
Yes	0	0	4 36%	2 14%	6 75%	12
No	16 100%	8 100%	7 64%	12 86%	2 25%	45
Total	16	8	11	14	8	57

Table 2: Breakdown of technology use by 'Do you use electronic banking?' categorised by IT Usage

### Information Technology Used by Current Users of Electronic Banking

From the respondent SMEs using electronic banking 6 or 75% had a "very high" use of IT, as shown in table 2. Compared to the other categories of IT use this was very significant with only 4 or 36% of respondent SMEs with "medium" IT use and 2 or 14% of respondent SMEs with "high" use of IT using electronic banking. No respondent SMEs with "very low" or "low" use of IT are using electronic banking, as these SMEs did not own modems. It is expected that SMEs with high use of technology can easily understand the benefits of electronic commerce from past experience using IT systems (Raymond 1985).

### Sales Volume of Current Users of Electronic Banking

Respondent SMEs using electronic banking had high sales volume. Within the category of sales volume over \$400,000 there were 9 or 30% of respondents within this class, as shown in table 3. In terms of overall SMEs the 9 respondents with sales volume over \$400,000 represent a high proportion, 1 (14%) of the SMEs with sales volume less than \$100,000 and 1 (25%) of the SMEs with sales volume between \$100,000 and \$200,000 are using electronic banking. SMEs with a high sales volume should have greater resources for IT. This will make the SME more inclined to purchase computer hardware and software and continue to expand their technology. However, if the SME does not have a history of technology use their sales volume will most likely not affect their use of electronic banking.

Do you use ebanking	< \$100 K	\$100 – 200 K	\$201 – 400 K	Over \$400 K	Total
Yes	1 14%	1 25%	0	9 30%	11
No	6 86%	4 75%	7 100%	21 70%	38
Total	7	5	7	30	49*

Table 3: Breakdown of sales volume by 'Do you use electronic banking?'

### Benefits Gained by SMEs Using Electronic Banking

Users of electronic banking must be seen to be gaining benefits, if other SMEs are to adopt this technology. Initial users have taken a risk to use electronic banking in a hope to gain a competitive advantage over organisations. Using electronic banking and their experiences with its use will have a profound affect the further adoption. The most significant benefit of electronic banking was the reduction in time spent on banking. It was expected that the main aim of introducing electronic banking was to reduce the operational staff expense of time in banking. From the respondents 9 or 75% have achieved a time saving, as shown in table 4.

Benefit of Electronic Banking	No. of responses	% of total responses
Saved time	9	75%
Reduced costs	4	33%
Increased information	4	33%
More convenient	3	25%
Easier to complete	2	17%

Table 4: Benefits gained from using electronic banking.

The timesavings have been achieved in many forms, with one respondent SME replying that 'banking can be done after hours' an obvious advantage of electronic banking. A lesser benefit was the ability to: reduce costs associated with banking i.e., 4 (9%) responses; and to obtain greater amounts of information, 4 (9%) responses. While the greatest benefit to electronic banking is time saving other spin-off benefits are achievable. Banking is a continuous service and the introduction of arms length communication provides SMEs more convenience and the ability to obtain more information.

### Increased Cash Flow as a Benefit of Electronic Banking

As SMEs have limited resource, cash flow is a vital aspect of their survival and one that must be continually monitored. Two payments methods that improve cash flow are cash and Electronic Funds Transfer (EFT) as they have little or no clearing period. In EFT SMEs do not have to physically handle payments, they can be received electronically which improves the cash flow and is more convenient.

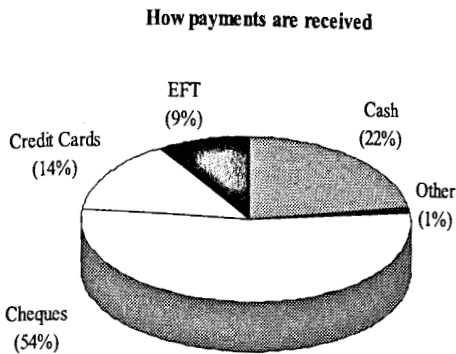


Figure 2.1: Breakdown of 'How payments are received by customers, suppliers and other

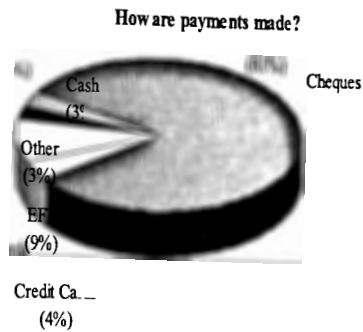


Figure 2.2: Breakdown of 'How payments are made to suppliers, employees, and other

All SMEs surveyed showed the average amount of payments received by cheque was 54% with only 9% being received by electronic funds transfer, as shown in Figure 2.1. This evidence suggests SMEs have a deeply entrenched mindset to use cheques to make and receive payments. This contradicts their willingness to accept various methods of payment. An average of 81% of SMEs payments made to suppliers, employees and other organisations are by cheque while 9% of their payments are by electronic funds transfer, as shown in Figure 2.2. With cheques being the second most costly method of funds transfer, to over the counter transfers, it is unusual that they persist in using this payment method while they try to cut costs in other areas of their business activities.

## PROBLEMS ENCOUNTERED BY CURRENT USERS OF ELECTRONIC BANKING

Respondent SMEs using electronic banking had a number of recurring problems with their use. It was expected that due to the adolescence of the technology a number of problems would be apparent. The problems encountered were implementation difficulties. These included:

*"Unable to pay all bills this way because not enough people use it."* The greatest weakness of electronic banking was the low volume of electronic banking users. Electronic banking is still a new product and at the growth stage of the technology life cycle where the volume of customers is set to increase. As the volume of SMEs using electronic banking increase problems associated with a lack of people using this technology will decrease. However, the volume of users needed before this problem ceases is unknown (Stienfield et al. 1995).

*"Alterations to internal systems have been necessary. Obtaining suppliers bank details has required a lot of follow up."* Obtaining details from trading partners may time consuming. However, gaining suppliers may prove to be no more time consuming or involved than needed to obtain payment details from a new client of the SMEs. Furthermore some commercial packages, such as the Commonwealth Banks 'Quick Line,' provide a large range of account numbers for prominent organisations within Australia.

*"It is not clear that all perceived benefits will not be offset by increased costs."* For some respondent SMEs it is unsure whether the initial capital outlay to use electronic banking will provide a good return. Longitudinal research must be conducted to determine the impact electronic banking has on SMEs banking fees and reductions in staff hours spent on banking to establish the exact monetary benefit. Currently these exact monetary benefits are unknown but SMEs can determine savings in terms of reduced bank fees and reduced time.

## SMEs Not Using Electronic Banking

By SMEs not using electronic banking we must examine some of the root causes for their reluctance and impediments in adopting and using technology. In order for SMEs to using the electronic banking we must examine how these organisations use technology.

### Technology Use of SMEs not Using Electronic Banking

Expectedly SMEs with very low use of technology were unlikely to use electronic banking with only 9 or 31% of these SMEs considering its use, as shown in table 5. SMEs with very low use of technology must spend the greatest amount of resources to gain benefits from electronic banking. SMEs who would adopt electronic banking were expected to have high levels of technology as this mirrors other adoption models of IT inhibitors being economic costs and lack of technical knowledge.

	Very Low		Low		Medium		High		Very High		Total
Yes	4	31%	4	57%	8	100%	9	75%	2	100%	27
No	9	69%	3	43%	0		3	25%	0		15
Total	13		7		8		12		2		42

Table 5: Breakdown of 'Would you use electronic banking?' by technology use

### Sales Volume of SMEs not Using Electronic Banking

SMEs who expressed they would use electronic banking had, on average, higher sales volume and "high use" of technology. SMEs with sales volume over \$400,000 were the most likely to adopt electronic banking with 18 or 86% of SMEs within this sales volume bracket considered as users of electronic banking, as shown in table 6. The smaller organisations, ones with less than \$400,000 sales volume were divided as to whether they would or would not use electronic banking, i.e., 50% each. These SMEs would benefit greatly by using electronic banking and although this it was expected that they would not want to implement electronic banking as they could not see the benefit of improving their non-core activities.

	< \$100 K		\$100 - 200 K		\$201 - 400 K		Over \$400 K		Total
Yes	3	50%	1	50%	4	57%	18	86%	26
No	3	50%	1	50%	3	43%	3	14%	10
Total	6		2		7		21		36

Table 6: Breakdown of 'Would you use electronic banking?' by annual turnover

### Distribution of Information to SMEs Not Using Electronic Banking

Currently the majority of SMEs who had received information from banks but were not using electronic banking were larger in terms of employee size. It was found that only 8 or 26% of SMEs with 1-5 employees had received information from banks while among the other groups at least 50% of SMEs had received information, shown in table 7.

Received Info	1- 5		6 - 10		11 - 30		30 +		Total
Yes	8	26%	3	50%	3	60%	2	67%	16
No	23	74%	3	50%	2	20%	1	33%	29
Total	31		6		5		3		45

Table 7: Breakdown of 'Full time employees' by has any banks provided your organisation with information regarding Internet banking?

From the respondent SMEs not using electronic banking 43 provided a response to whether they would use this technology. In total 28 or 65% of these respondent SMEs had 1-5 employees making them the largest proportion of overall SMEs. The lack of information provided to this group would suggest that they may be unlikely to use electronic banking but there was a strong interest in electronic banking with 16 or 57% of SMEs with 1-5 employees willing to use electronic banking, shown in table 8.

It is unclear as to why these smaller respondent SMEs have been excluded from the provision of information by banks, they may not be interested in the SMEs or that they have somehow been overlooked. Either way this group of SMEs shows great potential and should be encouraged by banks as they provide a lucrative market which will improve the efficiency of electronic banking for all users.

Ebanking	1-5		6-10		11-30		30+		Total
Yes	16	57%	3	50%	5	100%	3	100%	28
No	12	43%	3	50%	0		0		15
Total	28		6		5		3		43

**Table 8: Breakdown of 'Would you use electronic banking?' by employees.**

## CONCLUSION

Electronic banking provides SMEs with a mechanism to reduce the overall time spent on the non-core activity of banking. Importantly, the banking industry is uniquely placed to facilitate the use of electronic banking. In Australia, the use and adoption of electronic banking by SMEs is in its formative stages. Clearly, the problems faced by SMEs in adopting are not inconsequential but can be overcome. SMEs currently using electronic banking already have a good use of technology.



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# A Framework for Assessing Electronic Commerce Success

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## ABSTRACT

*Organizations are adopting electronic commerce for a variety of reasons. Many companies are adopting e-commerce in order to stay in the business. Others (for example Banks) are adopting e-commerce in order to minimize cost of transaction. The obvious question is: are they successful? The literature does not provide any framework for assessing e-commerce success. This study attempts to fill this gap by developing a framework of e-commerce success using operational-quantitative and strategic-qualitative approaches. The use of both approaches aims to create a comprehensive and robust measurement model. Key factors impacting electronic commerce are identified from detailed literature review. These factors are then differentiated according to their contribution to the success of electronic commerce and according to the locus of impact. The final model is then cast in structural equation modeling framework.*

*Key words: Electronic commerce, Structural equation modelling*

## INTRODUCTION

Electronic commerce, both Internet based or otherwise, is changing the way organizations are performing their tasks, interact with customers and, in general, do their business. Electronic commerce is not only 'buying and selling' of product via electronic means, it involves all other activities to support the sale process (Applegate et al., 1996). We adopt the definition of electronic commerce as provided by Wigand (1997) and Kalakota & Whinston (1997) as follows: "electronic commerce includes any form of business activity conducted via electronics means, which might range from products/services information to selling and/or buying products/services".

Though the need to assess the impact of electronic commerce is recognized, it is not an easy task to measure it. The lack of such measures could result in difficulties when assessing the performance of e-commerce relative to alternative strategies (Rose et al., 1999). The problems in measuring general IS success was highlighted by Delone (1992). The author argued that study in this particular area has been elusive, since each author may define IS success quite differently. With regard to electronic commerce success, a similar problem prevails. Some researchers use technical-quantitative measures such as hit and page view (Kroll, 2000; Rose et al., 1999). Others may use qualitative assessments, for example the firm's goal attainment and competitive advantage (Ng et al. 1998). These inconclusive results, then, call for a more comprehensive electronic commerce success measure that can accommodate multiple criteria of success.

This study thus aims to develop a framework for assessing electronic commerce success. In doing so, the factors affecting e-commerce success are identified from a comprehensive literature review. The framework provides four scenarios for factors affecting electronic commerce success. They are classified as 'drivers' and 'impediments' of e-commerce success, and whether the impacts are "internal" or "external" to the organization. In the next several sections we first provide theoretical perspectives on factors of e-commerce success. We then provide detailed description of the key factors followed by the proposed e-commerce success model. Conclusions and future work are then presented.

## THEORETICAL PERSPECTIVE ON FACTORS AFFECTING ELECTRONIC COMMERCE SUCCESS

We develop the electronic commerce success framework using a multiple criteria approach. It is suggested that the success or failure of electronic commerce is largely determined by its ability to minimize the impediments and to enhance the drivers. To obtain comprehensive understanding of the electronic commerce impacts, these dimensions need to be differentiated further according to the locus of impacts, i.e. whether they are internal or external to the organization. The internal impacts include benefits and impediments of company using e-commerce. The external impacts consist of benefits and impediments with respect to the external parties such as customers and suppliers. The framework is shown in table 1 below.

Table 1: Electronic Commerce Success Framework

Locus of Impact		Internal	External
Contribution to Success	Driver	Cost Leadership Reputation Market Business Entry Cell 1	Product Pricing Time Spent Convenience External Relationship Cell 3
	Impediment	Financial Risks Expertise Cell 2	Customer's Expense Delivery Time Transaction Risk Access Cell 4

## ELECTRONIC COMMERCE DRIVERS AND IMPEDIMENTS

The literature suggests a number of positive impacts of electronic commerce. Among them, cost saving is the most cited one. E-commerce enables firms to reduce the telecommunication costs, minimizes warehousing expenses, and cuts down the distribution chain leading to cost savings. Firms are also benefited by the global reach of electronic commerce since it means the wider market base and opportunities to increase market share.

However, a number of authors also suggest some factors that may hinder the benefits of electronic commerce. Financial consideration is often mentioned as inhibitor to the adoption of electronic commerce (PricewaterhouseCoopers, 1999). Computer and networking technology are still considered as expensive, therefore many companies, especially the SMEs, cannot afford the total costs of ownership (TCO) of electronic commerce (De' and Mathew, 1999; Nath et al., 1998). In addition, legal and liability issues are also perceived as matter of concern. The borderless nature of e-commerce adds further complexity to the problems. Table 2 presents past research on e-commerce and categorizes them in terms of Drivers (internal and external) and Impediments (internal and external). It is interesting to note that most of the authors (17 of them) dealt with internal drivers, followed by external drivers (13), and internal and external impediments (7 each). Most of the past studies, therefore, dealt with the "benefits" of e-commerce than its "costs".

Table 2: A Summary of Research on the Factors Affecting the Success of Electronic Commerce

Authors	Research Approach	Sample	Industry	CONTRIBUTION TO SUCCESS OF ELECTRONIC COMMERCE			
				Internal Drivers	Internal Impediments	External Drivers	External Impediments
(Auger and Gallagher, 1997)	Survey	141	SMEs	✓	✓	✓	✓
(Benjamin and Wigand, 1995)	Conceptual overview	N/A	N/A	✓	✓		
(Brynjolfsson and Smith, 2000)	Survey	41	Retail			✓	
(Chan and Swatman, 2000)	Case study	1	Steel Company	✓			
(De' and Mathew, 1999)	Conceptual overview	N/A	N/A	✓	✓	✓	
(Ghosh, 1998)	Conceptual overview	N/A	N/A	✓		✓	
(Grover and Ramanlal, 1999)	Conceptual overview	N/A	N/A	✓			
(Keeney, 1999)	Conceptual overview	N/A	N/A	✓		✓	
(Malone et al., 1987)	Conceptual overview	N/A	N/A	✓			
(Nath et al., 1998)	Interview	10	Mixed	✓	✓		✓
(Ng et al., 1998)	Survey	98	Mixed	✓			
(Palmer, 1997)	Survey	120	Retail			✓	✓
(Poon and Swatman, 1999)	Survey	59	SMEs	✓			
(Poon and Swatman, 1998)	Survey and Case Study	23	SMEs	✓			
(PricewaterhouseCoopers, 1999)	Survey and Interview	N/A	SMEs	✓	✓	✓	✓
(Riggins, 1999)	Conceptual overview	N/A	N/A	✓		✓	
(Rose et al., 1999)	Conceptual overview	N/A	N/A		✓		✓
(Saunders, 2000)	Conceptual overview	N/A	N/A		✓	✓	
(Shon and Swatman, 1998)	Delphi survey	19	Mixed			✓	
(Strader and Shaw, 1997)	Conceptual overview	N/A	N/A	✓		✓	
(Strader and Shaw, 1999)	Survey	48	Mixed			✓	✓
(Venkatraman, 2000)	Conceptual overview	N/A	N/A	✓		✓	✓
(Wigand, 1997)	Conceptual overview	N/A	N/A	✓			

## MEASURES OF E-COMMERCE SUCCESS

Prior studies suggest that there were no conclusive measures of electronic commerce success. A number of studies suggest the use of computer-reported measures that are considered as more objective (Straub et al., 1995), for example number of 'hit'. However, the use of 'hit' as a measure could be less meaningful than other measures and can be misleading (Ayres, 2000). Using the hit as a measure, the number of people visiting the web site is counted based on the number of IP addresses that download pages from a site. A problem will arise when visitors use the Internet from public facilities such as offices and schools. The web site will only record one individual from that IP address, regardless of the number of people from that particular place visiting the same site. Another problem could emerge from internal maintenance activities. The employees who perform the job will be regarded as visitors. Therefore, the 'hit' measure will still count them (Rose et al., 1999).

Due to the limitation of 'hit', other measures have been proposed to obtain better measures. 'Page view' might be considered as better since it brings in time variable rather than simply counting the number of visitors. It shows the number of pages a visitor downloads over a given period (Kroll, 2000). Alternatively, 'stickiness' can also be used to measure a web site's performance. It tells how long each visitor remains on a site (Kroll, 2000). The longer they remain on a site, the more chances are that they will buy the products offered. Finally, the 'conversion rate' is a comprehensive measure and is regarded as more powerful than other measures. This metric is obtained by dividing the number of visitors over a period of time by the number of visitors who take some action, such as purchase (Gurley, 2000).

There are also strategic-qualitative measures, which can be used for electronic commerce success. As demonstrated by Sethi and King (1994) competitive advantage, achieved from the use of IT applications, can also be adapted for electronic commerce, i.e. competitive advantage attained due to e-commerce applications. DeLone and McLean (1992) measure IT success in terms of the firm's goal attainment, which can also be adapted for e-commerce success.

Rather than depending on one approach, this study uses both operational-quantitative and strategic-qualitative approaches to measure electronic commerce success. Table 3 presents the drivers, impediments, and e-commerce success measures along with the corresponding literature. We describe these factors in the next section.

**Table 3: Electronic Commerce Dimension and Proposed Measures**

Internal Driver

Dimension	Measures	Sources
Cost Leadership	E-commerce enables cost savings in performing business activities.	(Benjamin and Wigand, 1995), (Auger and Gallagher, 1997), (Ng et al., 1998), (Poon and Swatman, 1999), (Grover and Ramanlal, 1999), (Venkatraman, 2000) (Malone et al., 1987; Poon and Swatman, 1998; Wigand, 1997)
	E-commerce enables a reduction in warehousing costs.	(Chan and Swatman, 2000)
	E-commerce enables a reduction in distribution costs.	(Benjamin and Wigand, 1995), (Ghosh, 1998), (Ng et al., 1998), (Riggins, 1999)
	Marketing costs become lower using e-commerce.	(Strader and Shaw, 1997), (Auger and Gallagher, 1997), (Nath et al., 1998), (Poon and Swatman, 1999) (Poon and Swatman, 1998)
Reputation	Using e-commerce leverages the firm's reputation.	(Auger and Gallagher, 1997), (Nath et al., 1998), (Poon and Swatman, 1998) (De' and Mathew, 1999)
Market	E-commerce enables the firm to expand the base of consumers both nationwide and overseas.	(Auger and Gallagher, 1997) (Poon and Swatman, 1998) (Nath et al., 1998) (Riggins, 1999)
	E-commerce enables the firm to collect information from consumers and web visitors.	(Auger and Gallagher, 1997) (Ng et al., 1998) (Poon and Swatman, 1999)
	E-commerce consumers have better education and are more affluent than average consumers.	(Auger and Gallagher, 1997) (Poon and Swatman, 1998)
Business Entry	There is no barrier for entry to conduct business using e-commerce.	(Nath et al., 1998)

### Internal Impediment

Dimension	MEASURES	Sources
Financial	E-commerce reduces profit margin per product or per transaction.	(Benjamin and Wigand, 1995)
	The organization is concerned about the total cost of e-commerce ownership (e.g. set up cost, connection cost, hardware cost, and maintenance cost).	(Nath et al., 1998), (De' and Mathew, 1999) (PricewaterhouseCoopers, 1999) (Saunders, 2000)
Risks	E-commerce increases security risk.	(Kalakota and Whinston, 1996) (De', 1999 #318) (Rose et al., 1999) (Saunders, 2000) (Furnell and Karweni, 1999)
	It is difficult to monitor visitor activities in firm's web site.	(Auger and Gallagher, 1997)
	Legal issues are matter of concern in e-commerce transactions.	(Nath et al., 1998) (PricewaterhouseCoopers, 1999)
Expertise	It is difficult to obtain experts in e-commerce	(Nath et al., 1998)

### External Driver

DIMENSION	Measures	Sources
Product Pricing	E-commerce provides products and/or services cheaper than retail-shop.	(Palmer, 1997), (Strader and Shaw, 1997) (Strader and Shaw, 1999), (Brynjolfsson and Smith, 2000)
Time Spent	E-commerce allows for faster processing of customer orders.	(Kalakota and Whinston, 1997) (Lynch and Lundquist, 1996)
	E-commerce allows consumers to find and select products faster.	(Riggins, 1999)
Convenience	E-commerce allows consumers to shop at the firm's virtual shop anytime.	(Saunders, 2000)
	E-commerce allows the firm to offer personalized services for customers.	(Venkatraman, 2000) (De' and Mathew, 1999)
	E-commerce allows consumers to pay online.	(Shon and Swatman, 1998)
	Consumers can perform transactions easily.	(Venkatraman, 2000) (Riggins, 1999)
External Relationship	E-commerce enables the firm to provide 24 hours, 7 days a week customer service.	(Auger and Gallagher, 1997) (Riggins, 1999)
	E-commerce improves information exchange with suppliers and customers.	(Ghosh, 1998) (Riggins, 1999) (PricewaterhouseCoopers, 1999)

### External Impediment

DIMENSION	Measures	Sources
Customer's Expense	Consumers performing online transaction incur higher costs than retail shopping consumers.	(Keeney, 1999) (Strader and Shaw, 1999)
	Delivery cost is a consumer's concern when conducting transaction online.	(Strader and Shaw, 1999)

Delivery Time	Delivery time is a consumer's concern when conducting transaction online.	(Palmer, 1997)
Transaction Risk	Security is a consumer's concern when conducting transaction online.	(Auger and Gallagher, 1997) (Nath et al., 1998) (Rose et al., 1999) (Furnell and Karweni, 1999)
	Privacy is a consumer's concern when conducting transaction online.	(Venkatraman, 2000)
Access	Slow internet access is a barrier for consumers in conducting transactions online.	(Auger and Gallagher, 1997) (Rose et al., 1999)

### Electronic Commerce Success

#### Strategic

DIMENSION	Measures	Sources
Firm's Goal	What is e-commerce contribution to meet firm's goal?	(Delone and McLean, 1992)
Competitive Advantage	Overall, the competitive advantage provided by e-commerce is (if e-commerce was a defensive move aimed at countering a threat, the overall success of the system has been):	(Sethi and King, 1994) (Ellsworth and Ellsworth, 1994) (Ng et al., 1998)

#### Operational

DIMENSION	Measures	Sources
Conversion Rate	The conversion rate of my company's e-commerce is:	(Gurley, 2000)
Hit	The number of visitors visiting a site.	(Rose et al., 1999)
Page View	The number of pages visitors visit over a given period.	(Kroll, 2000)
Stickiness	The length of time visitors remain on a site.	(Kroll, 2000)



## ELECTRONIC COMMERCE SUCCESS: DESCRIPTION OF THE KEY FACTORS

This section describes the factors affecting electronic commerce success.

### **Internal Driver**

The internal driver is defined as *perceived/expected benefits in using e-commerce*. This factor will have positive impact on e-commerce success. Internal driver is reflected by the following sub-factors.

#### ***Cost Leadership***

Literature shows that electronic commerce can reduce the costs associated with the information processing needed to perform the company's primary process (Auger and Gallagher, 1997; Benjamin and Wigand, 1995; Grover and Ramanlal, 1999; Malone et al., 1987; Ng et al., 1998; Poon and Swatman, 1999; Venkatraman, 2000; Wigand, 1997). This cost saving can be attained by using net-based catalogues, automatic credit card authorization and minimizing human error (Auger and Gallagher, 1997). Chan & Swatman (2000) demonstrate that electronic commerce can reduce the inventory cost. The presence of electronic commerce reduces the layers of intermediaries that in turn reduce the distribution cost (Benjamin and Wigand, 1995; Ghosh, 1998; Ng et al., 1998; Riggins, 1999). Therefore, e-commerce is extra channel to distribute products – even in some cases, bypassing existing channels. Some authors argue that e-commerce is a low cost marketing medium since it enables firms to disseminate information regarding products and services globally at minimum cost (Auger and Gallagher, 1997; Nath et al., 1998; Poon and Swatman, 1999; Strader and Shaw, 1997).

#### ***Reputation***

E-commerce is suggested as having the ability to increase company's reputation (Auger and Gallagher, 1997; De' and Mathew, 1999; Nath et al., 1998; Poon and Swatman, 1998). This is even truer for larger businesses than smaller ones (Auger and Gallagher, 1997). A study by Nath et al. (1998) reveal that the presence of an organization on the Internet may be triggered by the like action of their competitors. It might be considered that the company's image will be undermined if it does not follow a competitors' action.

#### ***Market***

The Internet has opened new opportunities to access a broader market. Electronic commerce can help firms to sell products and services to an overseas market more easily (Nath et al., 1998; Riggins, 1999). Furthermore, Auger and Gallagher (1997) reveal that Internet consumers are more affluent and educated than the average people. Indeed, they are a potential target market for particular products and services such as computer hardware and software, insurance, and banking. Also, e-commerce allows firms to 'learn' about their consumers' preference when tracking visits to particular web sites. Often, consumers and visitors are not aware that they are under 'surveillance' and that their actions can be tracked. In addition, information collected using these techniques can be used to conduct market research (Auger and Gallagher, 1997; Ng et al., 1998; Poon and Swatman, 1999).

#### ***Business Entry***

It is considered that e-commerce has a low barrier to entry even for small businesses (Nath et al., 1998). Since there is no single party that can claim to be the owner of the Internet, it is open to anybody.

## Internal Impediments

'Internal impediment' is defined as *perceived constraint or likely constraint in using e-commerce*. This factor will have negative impact on e-commerce success. Internal impediment is reflected by the following sub-factors.

### Finance

The Internet is believed to be able to deliver goods and services more cheaply. This provokes some people to seek bargains on the Internet. However, this phenomenon does not necessarily mean more profit for the businesses concerned. While the number of transactions might go up on one hand, on the other, there could be a decrease in profit margin per transaction (Benjamin and Wigand, 1995). Another financial concern regarding the implementation of electronic commerce is the total cost of ownership (De' and Mathew, 1999; Nath et al., 1998; Saunders, 2000) such as set-up costs, connection costs, hardware costs and maintenance costs, among others. The total amount of costs together with unpredictable results may result in barriers to embrace e-commerce.

### Risks

Kalakota and Whinston (1996) define security threat as "a circumstance, condition or event with the potential to cause economic hardship to data or network resources in the form of destruction, disclosure, modification of data, denial of service, and/or fraud, waste and abuse." Online businesses have certain security risks, such as viruses and hackers, due to the presence of a web server on their sites (Saunders, 2000). Further risk factors include the fact that the web-based databases might be copied, stolen, altered or destroyed by unauthorized users. The results might range from spoilt reputation to serious damage, even loss of a whole database (Saunders, 2000). Although many techniques, such as a firewall, can be used to protect the online database, the risks are still there since hackers will always attempt to find the security loopholes. Indeed, the real threat often exists within the business boundaries rather than from external sources (Rose et al., 1999).

Another impediment is that online businesses often find it difficult to monitor the use of the web site (Auger and Gallagher, 1997). Although statistics from the visitors who log on to the website may help, a lot of visitors' information remains unknown. Some companies require registration procedures before someone is granted an authorization to visit the web site and require that cookies be placed in the user's computer. This mechanism allows the company to analyze the visitor's pattern of use.

Nath et al. (1998) demonstrated that legal issues are an important consideration in conducting online business. A subsequent study by PricewaterhouseCoopers (1999) validates these findings. There are many questions regarding legal and liability issues. The enforceability of cyber law, legal jurisdiction, intellectual property rights and electronic evidence validity are some of these concerns (PricewaterhouseCoopers, 1999).

### Expertise

Electronic commerce involves some areas of expertise such as the web developer, the content provider and customer service (Nath et al., 1998). The market need for people with these skills is quite high. Therefore, it is not an easy task and could be expensive to acquire and employ these people internally. Outsourcing, therefore, then becomes a possible answer to such problems.

## **External Driver**

The external driver is defined as *perceived/expected benefits to the external parties as a result from the company using e-commerce*. This factor will have positive impact on e-commerce success. External driver is reflected by the following sub-factors.

### ***Product Pricing***

Theory suggests that online shops might be able to deliver better value for money on products and services than retail shops due to cost savings. Strader and Shaw (1997) argue that the presence of an electronic market in regard to particular products and/or services such as, books, music and airline tickets, has reduced the likelihood of consumers being overcharged due to limited information regarding other prices. This notion is supported by their subsequent study (Strader and Shaw, 1999). Additionally, Brynjolfsson and Smith (2000) also found that Internet prices are lower than retail outlet prices depending on the products' cost structures and product types. However, this is not always the case. According to Palmer (1997), although the mean web store price is the lowest, price differences between a web store and other formats such as catalogue and cable TV are not significant.

### ***Time Spent***

One benefit of electronic commerce for consumers is time saving (Lynch and Lundquist, 1996). Kalakota and Whinston (1997) use 'time compression' as an expression to illustrate the capability of electronic commerce in shortening the business cycle. As such, time required in certain processes of product purchasing, including order time, processing time, queuing time and payment time could be reduced considerably. In doing so, many web sites are offering facilities, for instance online catalogues, shopping carts and online payments. For particular products such as software, these web sites are often able to deliver the product online (Riggins, 1999).

### ***Convenience***

For some people, doing transactions online is considered more convenient than at the 'bricks and mortar' shop due to certain factors including flexibility of business hours. Electronic commerce allows businesses to open their virtual outlets 24 hours x 7 days a week (Saunders, 2000), so that consumers can 'go shopping' at their convenience. Furthermore, some online businesses offer online payment mechanisms using credit cards. However, it is recognized that many people are concerned about the use of credit cards in online payment. Therefore financial transaction systems to overcome this problem have been developed, for instance by using 'internet payment systems' (Shon and Swatman, 1998). Another e-commerce convenience is the possibility of delivering streamlined transactions as well as personalized service (De' and Mathew, 1999; Ghosh, 1998; Venkatraman, 2000). Customers can accomplish the transactions simply in one click. The need for repeated information and multiple forms can be minimized using 'software agents' that automate tasks (Riggins, 1999).

### ***External Relationship***

The presence of electronic commerce can lead to better and easier interaction with customers as well as suppliers (Ghosh, 1998; PricewaterhouseCoopers, 1999). Customer service functions can benefit from the interactive nature of web-based applications that facilitate customer feedback and enquiries through various means, for example e-mail and online survey (Auger and Gallagher, 1997; Riggins, 1999). To give such easy, 24 hours-a-day availability, with the possibility of quick response, online businesses may offer an online help desk - such as "FAQ" facility - to provide answers to the customers' enquiries with less direct human involvement. An online survey by Pricewaterhouse Coopers (1999) revealed that most significant potential benefit of electronic commerce realized by small and medium enterprises (SMEs) is customer-focused service and information exchange. The study suggests that there is growing awareness of the possibilities of enhanced and more efficient customer-supplier relationship (B2B) among SMEs.

## **External Impediment**

The external impediment is defined as *perceived/expected impediments faced or likely to be faced by external parties in dealing with the company using e-commerce*. This factor will have negative impact on e-commerce success. External impediment is reflected by the following factors.

### *Customer's Expense*

To be able to participate in an e-market, consumers have to get access to the Internet. While some consumers may use free access in the office or at school, others have to pay an Internet connection fee and telephone charges which vary among service providers. Strader and Shaw (1999), who named these costs 'market costs', stated that in an e-market consumers have market costs that they do not pay in the 'bricks and mortar' market. In addition, they argued that the extent to which these costs can be minimized would determine the choice between e-market and traditional market. A similar view was presented by Keeney (1999) who addressed the role of 'value proposition' – which includes the benefits and costs of ordering product online – in influencing the means of purchasing products and/or services.

### *Delivery Time*

Compared to other retail formats, the online store seems to lag behind in terms of the deliveries of products and services (Palmer, 1997). Most products cannot be delivered immediately with the exception of digital products such as software, which can be downloaded and used almost instantly. Hence, to compete with retail shops or other formats, online businesses have to minimize the delivery time.

### *Transaction Risks*

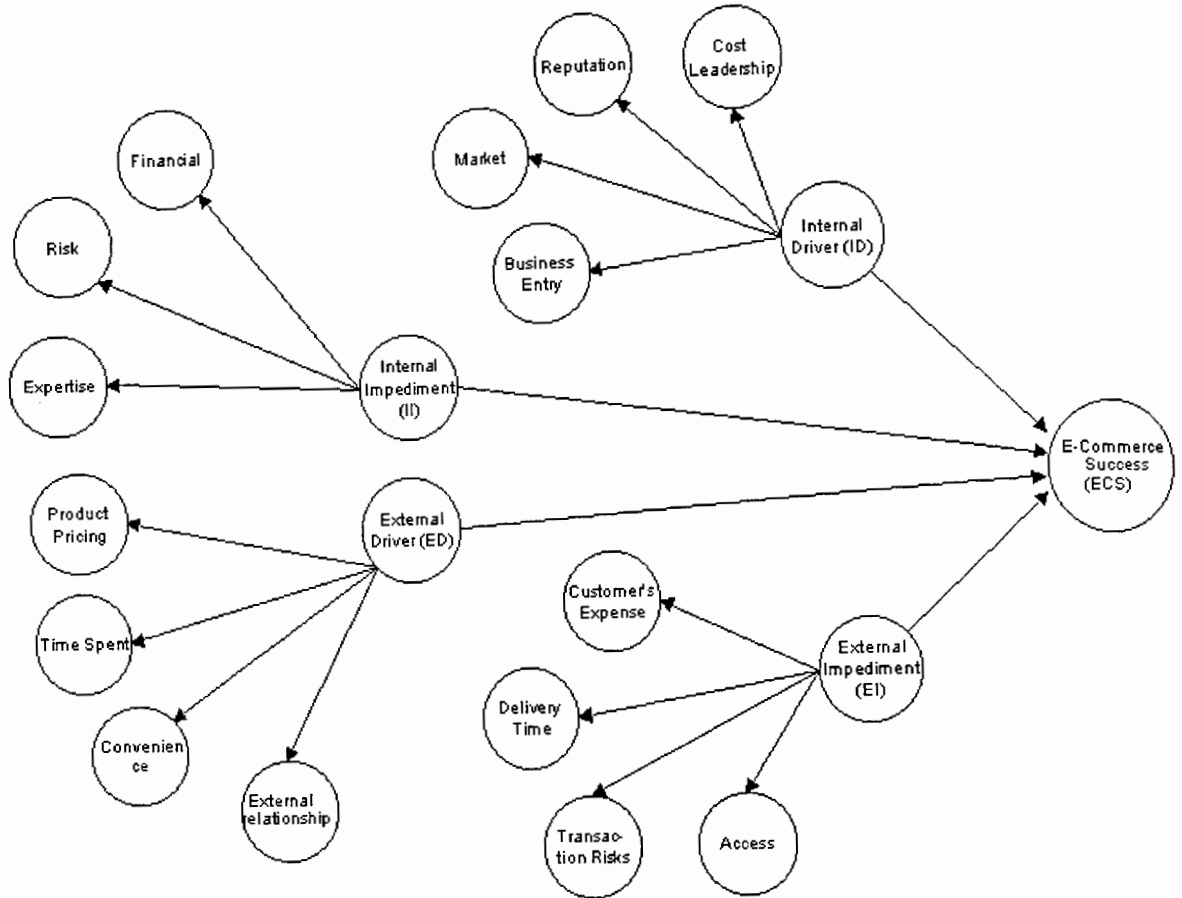
Undoubtedly, many people are reluctant to shop online due to 'perceived' security risks (Auger and Gallagher, 1997; Furnell and Karweni, 1999). The Internet is often seen as unsecured place to conduct business transactions. When transaction data is sent through the Internet, there is always a chance that someone – wherever he or she is – will eavesdrop and intercept that information to use it for his or her own interests (Nath et al., 1998). Credit card fraud is a classical example of this kind. It is argued that such problems mostly tend to be a managerial rather than a technological one (Rose et al., 1999). Another risk that may hinder B2C electronic commerce is privacy. The challenge is to convince customers that their information details are safeguarded, strictly confidential and will only be used for delivering superior value to them (Venkatraman, 2000). Further, the cyber privacy intrusion in the form of unsolicited e-mail and the use of 'cookies' to track the users behavior may be seen by many as a disincentive to the use of e-commerce.

### *Access*

To attract visitors interest, web sites often use high-resolution graphics, video and audio streaming, which are usually large files. Therefore, a high-speed Internet access is required, which unfortunately is not always easy to obtain (Auger and Gallagher, 1997). Otherwise, web site presentation might be slow, delayed and disrupted leading to visitors' dissatisfaction. Indeed, Rose et al. (1999) argue technological impediment is not merely a matter of file size. It also pertains to the nodes' configuration technology, the infrastructure of the network as well as bandwidth connection.

## PROPOSED ANALYTICAL MODEL

The proposed analytical model, as presented in Figure 1, is developed in Structural Equation Modeling (SEM) framework (Chin 1998a). It is suggested that the latent variables (first and second order) are reflective in nature (Barclay et al., 1995; Chin, 1998a; Chin, 1998b). The measures (see Table 3) are assumed to produce the first order latent variables (LVs) and these first order LVs in turn influence the second order LVs (see Figure 1).



**Figure 1: Electronic Commerce Success Model**

In terms of the independent variable, there are 15 first order LVs obtained from prior studies and 4 second order LVs that were designed for this particular study. The second order LV, 'internal driver', includes the following first order LVs – cost leadership, reputation, market and business entry. Then, the second order LV 'internal impediment' contains first order LVs such as financial, risk and expertise. Next, the second order 'external driver' includes first order LVs as follows: product pricing, time spent, convenience, and external relationship. Finally, the second order 'external impediment' comprises first order LVs: customer's expense, delivery time, transaction risk and access. The dependent variable in this model is 'electronic commerce success' which is measured by constructs, 'competitive advantage', 'firm's goal', 'conversion rate', 'page view', 'stickiness' and 'hit' (see section 2 and Table 3).

Although there are some other multivariate analytical tools, the PLS type of Structural Equation Modeling is considered as suitable for the current study for the following reasons. First, the PLS allows the minimization of demand on measurement scales and sample size (Barclay et al., 1995; Chin, 1998b; Fornell and Bookstein, 1982); second, multivariate normality is not required (Barclay et al., 1995; Fornell and Bookstein, 1982); third, it is appropriate for use in the early theoretical development (Chin, 1998a; Fornell and Bookstein, 1982). Finally, compared to the first generation multivariate techniques such as regression, the PLS gives the researcher greater flexibility to play between theory and data (Chin, 1998b).

## CONCLUSIONS AND FUTURE WORK

To evaluate the success of electronic commerce, businesses need metrics. Past studies demonstrate the extensive use of operational-quantitative measures such as the hit, the page view, the stickiness and the more recently, conversion rate. These computer-reported measures are considered as more objective, since they do not rely on individual perception. Additionally, to be comprehensive, the framework also incorporates strategic-qualitative measures gleaned from the IT field. These measures capture the impact of electronic commerce on the businesses' goal attainment and competitive advantage. The literature also suggests some key factors that affect the performance of electronic commerce. Based on the direction of impact, the framework differentiates these factors into driving and impeding factors. These factors are then differentiated according to their contribution to the success of electronic commerce and according to the locus of impact. As an attempt to test the framework, the current study proposes to use PLS type of Structural Equation Modeling.

We have just finished a comprehensive survey of top Australian organizations based on the model of Figure 1. The data is being analyzed currently. The initial results indicate that both internal and external "drivers" significantly impact the e-commerce success, while the impacts of internal and external "impediments" on e-commerce success are not significant. This initial results support the popular belief that organizations adopt e-commerce primarily based on what "benefits" e-commerce can provide, rather than the associated "costs" of e-commerce. Our literature review (see section 2.1) also revealed that most of the prior research dealt with the "benefits" of e-commerce than the "costs".

The model validation and full results will be subject of our future paper.

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# Developing e-learning environments that support knowledge construction in higher education

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## ABSTRACT

*Much of the conventional development of Web-based learning environments the creation of electronic forms of existing print-based materials. In such instances the Web-based courses have tended to display limited evidence of an underpinning learning design and varying degrees of use of the opportunities and affordances of the new technologies. This paper provides an overview of instructional design principles that can guide the creation of Web-based learning materials that support learner engagement and knowledge construction. The paper describes the attributes of constructivist learning settings and provides some examples of explicit learning designs that can be applied in the design of Web-based learning environments. It describes strategies that are currently underway that are looking to provide ways to mainstream effective Web-based learning designs.*

*Keywords: instructional design, on-line, e-learning, higher education, constructivist*

## INTRODUCTION

The jury appears to still be out in relation to some of the benefits to higher education of contemporary e-learning projects and activities. E-learning has been mooted as the solution to many of the problems that face institutions of higher education. Many writers have argued the use of e-learning to attract new markets and new students, others have argued its capacity to increase levels of equity and access for existing students., while others see the new technologies as capable of reducing the costs of delivery of programs and courses. While many of these claims and potentials have yet to be verified the one thing we have learned from our activities in this domain is that e-learning, when done well, can improve learning and deliver enhanced learning outcomes. The intention of this paper is to explore strategies that can be used to assist in the design of effective e-learning environments. In essence, it attempts to provide a blueprint for design which academics can follow when they wish to create effective e-learning environments.

## INSTRUCTIONAL DESIGN FOR WEB-BASED LEARNING

In a previous paper, I described a framework for designing online learning settings (Table 1). The framework comprises three interconnecting elements which are presented as critical components for the design of learning settings. In particular, the framework highlights various distinctions between the elements involved in the design of online learning settings (Oliver, 1999).

**Table 1: Framework describing critical elements of online learning settings**

learning design elements	description
learning tasks	The activities, problems, interactions used to engage the learners and on which learning is based
learning resources	The content, information and resources with which the learners interact and upon which learning is based
learning supports	The scaffolds, structures, encouragements, motivations, assistances and connections used to support learning

The framework provides a means to identify the various elements within learning settings and suggests emphases which can be made in the instructional design process. Contemporary learning theories posit that the forms of learning design most appropriate to higher education are those based on constructivist learning principles. The above framework takes on particular and discrete forms when applied this way.

## **LEARNING TASKS**

The learning activities in technology-based environments play a fundamental role in determining learning outcomes (Wild & Quinn, 1997). They determine how the learners will engage with the course materials and the forms of knowledge construction that will take place. Contemporary thinking suggests that the activities must be active and engaging (eg. Wild & Quinn, 1997). They need to engender cooperative and collaborative activities among the cohort and in doing so must provide opportunities for reflection and articulation. The activities must provide the purpose and the context for learners to deal with the content and information (Duffy & Cunningham, 1996).

A synthesis of the pedagogical features for constructivist learning in on-line settings suggests the need for instructional design approaches which promote learning outcomes through learning processes and strategies employing various modes of communication ( eg. Jonassen & Tessler, 1996; Collis, 1998). Fundamental to the notion of knowledge construction is an active role for the learner in which there is encouragement and reason to act independently and in a self-directed fashion. Characteristic of these approaches to learning are settings and activities which see learners assuming much of the responsibility for themselves in terms of what is learned and how it is learned (eg. Duffy & Cunningham, 1996).

## **LEARNING RESOURCES**

Choosing and developing content for flexible technology-based learning is seen by many teachers as the most important step in creating on-line learning environments. This is reflected in the resulting materials which often have a content-focus (eg. Dehoney & Reeves, 1998). It is sometimes estimated that on-line teachers spend 90% of their planning and development creating content and on-line learning resources. Contemporary thinking suggests that the content can, and should, assume a far lesser role in the design process. In constructivist learning environments learners need to be exposed to content that provides them with perspectives from a multitude of sources (eg. Herrington & Oliver, 1995). The materials need not all be on-line. The use of conventional materials along with electronic sources can provide the diversity often required. Previously designers created course materials where the content was rigidly organised and presented to the learners in a strict sequence. Today it is recognised that learners need to be able to access resources in a variety of ways and the absolute strictness and rigidity should be lessened (eg. Lebow, 1993).

Duschatel (1997) argues that content also needs to be chosen in a fashion which provides authentic examples and contexts. This argument is very much in line with situated learning principles. The move to outcomes-based and competency-based education is a reflection of this form of thinking. In such instances, the content is presented as a means to an end rather than an end in itself and it is the learner who must make most of the choices about which material to use and how to use it. There are many ways in which these principles and ideas can be implemented in on-line settings. Perhaps the best strategy to deal with this is to consider content as a resource for learning rather than the focus of learning.

## LEARNING SUPPORTS

The third and final critical design element from the framework is that of learning supports. Flexible and on-line learning environments need learning supports to be designed as integral parts of the learning process. The support is necessary to guide learners and to provide a feedback mechanism which is responsive and sensitive to their individual needs (eg. McLoughlin & Oliver, 1998). In distance education contexts, learner support is a term that often embraces more extensive mechanisms such as academic support, library support and counseling. In this paper, the term is used in a much narrower context and limited to aspects of the on-line learning environment alone.

A number of writers have developed strong frameworks to describe the ideal forms of support required for on-line learning environment and in each case, there is usually a strong argument made for an active and involved teacher (eg. Laurillard, 1993). The role of the teacher however, tends to be defined as that of a coach and facilitator in place of the more didactic style often assumed. In contemporary settings, this form of learning support is called scaffolding in recognition of the way in which it helps to build knowledge and is then removed as the knowledge construction occurs.

## APPROACHES TO INSTRUCTIONAL DESIGN

The framework described above discusses the various roles of each of the three elements. Often in the design process, designers emphasise one of the elements over others and in this way create an environment with particular attributes. Figure 1 below suggests differences in the nature of learning environments when one or more of the elements is emphasised in the design process.

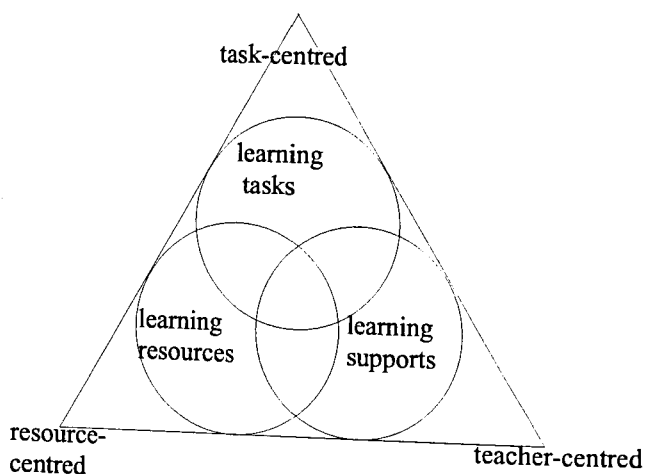


Figure 1: Instructional design emphases

Resource-based learning. In the past, many forms of online learning setting have been based on the delivery of online content. When the online environment is based on online content delivery, the resulting products are typically tend not to make the most of the opportunities afforded by the online technologies. Many writers are critical of such on-line learning settings for the narrowness of the instructional approaches they use.

Teacher-centred learning. More contemporary online learning settings make strong use of the communications facilities of the Web. For example, many teachers support their online courses with discussion fora and online communications. In this way they create roles for themselves as supports for learning. When Web-based learning is used as a support for classroom learning, the prominence of the teacher role leads to a teacher-centred approach. In remote learning settings, use of the online facilities in supportive ways creates this form of environment.

Task-centred learning. The third type of learning suggested by the framework derives from settings where the learning activities are the underpinning elements. Task-based approaches stem from the use of learning activities as the contexts and anchors for student learning. In such instances students work in various ways to complete tasks, inquiries and projects etc. with access to resources and with forms of online support. In this paper I argue that task-based learning provides the best opportunities for learning environments that support active learning and knowledge construction.

## **CONSTRUCTIVIST LEARNING SETTINGS**

The emergence of the new learning technologies appears to have coincided with a growing awareness and recognition of alternative theories for learning, theories that suggest many problems and inefficiencies with conventional forms of teaching. The theories of learning that hold the greatest sway today are those based on constructivist principles (eg. Duffy & Cunningham, 1996). These principles posit that learning is achieved by the active construction of knowledge supported by various perspectives within meaningful contexts. In constructivist theories, social interactions are seen to play a critical role in the processes of learning and cognition (eg. Vygotsky, 1978).

The strengths of constructivism lie in its emphasis on learning as a process of personal understanding and meaning making which is active and interpretative. In this domain learning is viewed as the construction of meaning rather than as the memorisation of facts (eg. Lebow, 1993; Jonassen & Reeves, 1996). Technology-based approaches to learning provide many opportunities for constructivist learning through their provision and support for resource-based, student centred settings and by enabling learning to be related to context and to practice (eg. Berge, 1998; Barron, 1998).

Many writers have in the past provided guidance for the design of constructivist learning settings by articulating the underpinning characteristics. For example, Cunningham, Duffy & Knuth (1993) argue that constructivist learning environments are characterised by seven pedagogical goals. They suggest that constructivist learning settings are those which concurrently:

- provide experience in the knowledge construction process;
- provide experience in and appreciation for, multiple perspectives;
- embed learning in realistic and relevant contexts;
- encourage ownership and voice in the learning process;
- embed learning in social experience;
- encourage the use of multiple modes of representation;
- encourage self-awareness in the knowledge construction process.

Lebow (1993) presents five principles that he considers are needed to integrate the affective and cognitive domains of learning in ways that support constructivist principles of learning. He argues the need for learning environments to:

- maintain a buffer between the learner and the potentially damaging effects of instructional practices;
- provide a context for learning that supports both autonomy and relatedness
- embed the reasons for learning into the learning activity itself
- support self-regulated learning by promoting skills and attitudes that enable the learner to assume increasing responsibility for the developmental restructuring process
- strengthen the learner's tendency to engage in intentional learning processes, especially by encouraging the strategic exploration of errors

Savery & Duffy (1995) argue that there are four principles that necessarily underpin learning in constructivist settings:

- learning is an active and engaged process;
- learning is a process of constructing knowledge;
- learners function at a metacognitive level;
- learning involves social negotiation;

Grabinger (1996) provides a succinct list of the assumptions of learning that are aligned with contemporary constructivist views:

- People transfer learning with difficulty needing both content and context learning.
- Learners are active constructors of knowledge.
- Learning is cognitive and in a constant state of growth and evolution.
- Learners bring their own needs and experiences to learning situations.
- Skills and knowledge are best acquired within realistic contexts.
- Assessment must take more realistic and holistic forms.

The descriptions which authors provide of the elements required for constructivist learning settings can help designers to understand the forms of learning activity which are required but often fail to provide adequate guidance for the actual learning designs that can encapsulate such principles in cohesive and supportive ways. Hannafin, Hall, Land Hill (1994) suggest that appropriate forms of learning settings are what they call open-ended learning environments. These are characterised by learner engagement in cognitively complex tasks involving such activities as problem solving, critical thinking, collaboration and self-regulation.

There are however a number of discrete learning designs that support constructivist learning and whose forms can provide designers with guidance and structure in the design of actual constructivist learning settings. In the literature many of these designs remain ill-structured in their definitions and descriptions which can limit teachers in their choice and use of them.

## CONSTRUCTIVIST LEARNING DESIGNS

When these ideas are put into practice, the forms of learning setting that result are similar in many respects and quite different to conventional settings. The designs tend to be based on forms of learning that are based on environment tend to be those that require learners to work with others and to share the results of their work and to reflect on the outcomes. They tend to be settings where there are no fixed resources or content to be learned and where the emphasis is on learning how rather than learning about. There are a number of discrete learning designs that accommodate these needs and some of these are discussed below.

**a. Problem-based learning (PBL)** is a learning design that found popularity in the mid 1980s in medical schools as an alternative to traditional forms of learning in this domain. Barrows (1992) describes a problem based setting where students work in small groups under the guidance of a facilitator in a problem-based setting where they are required to diagnose a patient's medical condition and to provide a rationale for their diagnosis and treatment. PBL involves presenting students with a real-life problem immersed in a context which is relevant to professional practice. Problem-based learning designs involve complex problems which provide a stimulus for learning. They provide students with the opportunity to immerse themselves into a context which requires more than memorisation and understanding of concepts and challenge them to apply their knowledge to determine the best outcome.

In PBL settings students apply their conceptual knowledge as well as processes and effective action learnt in solving the problem. Problem-based learning usually incorporates cooperative learning groups. Students work cooperatively in small groups identifying their prior knowledge and what they need to know to effectively solve the problem. Problems did not encourage simple, lower level solutions but demand that students pursue new knowledge through the process of solving the problem. The application of knowledge and skills is essential during the process of problem solving. The teacher's role is to facilitate a positive, encouraging cooperative learning environment and provide scaffolding at crucial times, as determined by the dynamic process of solving the problem.

**b. Case-based learning** is a form of problem-based learning but with unique characteristics. In case-based learning, students typically work through a problem setting which is usually a realistic case relevant to their course (medicine, business, etc). Students work through the case, either collaboratively or individually, and make decisions as to what would be the best course of action. A case is an abstract of an event and interpretations of experiences. It can either be a previously encountered and solved problem, or a typical way of solving a problem.

The characteristic feature of this type of learning activity is case-based reasoning. Case-based reasoning is a problem solving paradigm which utilizes the specific knowledge of previous experiences within concrete problem situations such as cases. A new problem is solved by finding a similar past case, and applying its solution to the new problem situation. Cases can have several components. If each component of the case is interpreted correctly the more useful it will be when it is necessary for the student to recall and apply similar knowledge and processes to another case (Kolodner & Guzdial, 2000).

**c. Project-based learning** engages students in the process of designing and creating products that meet authentic needs. It can focus on the central concepts and principles of a discipline through involving students in problem-solving investigations. Project-based learning lends itself to cooperative learning environments which enable students to discuss, explore, test ideas and concepts supported by a team environment. Even so, projects can be worked on autonomously. Project-based learning environments are considered authentic in nature and provide a learning environment which stimulates and encourages students to construct their own knowledge and pursue their own interests resulting in the creation of realistic products (Guzdial, 2000).

**d. Inquiry-based learning** describes a learning design where students are faced with an open-ended task for which they must formulate investigative questions, obtain factual information, and then build the knowledge that enables them to answer the original question. The form of learning is a hybrid of problem-based learning with its own idiosyncratic features. Students are often required to observe and question, present explanations, devise and conduct tests to test their theories; analyse data; draw conclusions, or design and build models. Inquiry-based learning emphasises research, critical thinking and multi-disciplined study to achieve course outcomes. Inquiry-based learning is sometimes discussed in conjunction with problem-based learning. Jakes, Pennington & Knodle (2001) describe inquiry-based learning as a process where students formulate questions or the teacher provides questions to stimulate investigative processes to obtain information to help build knowledge to effectively determine a solution. Typically students are aided with questions or scaffolds provided by the teacher or other students.

Inquiry-based learning differs from problem-based learning by virtue of its use of a greater range of learning methods, high levels of teacher support and scaffolding, and an emphasis on an interdisciplinary approach to learning, critical thinking as well as students assuming responsibility for their own learning (Magnussen, Ishida & Itano, 2000). Inquiry-based learning can involve other forms of learning design including discussions, group exercises and role plays. The strategy makes strong use of student interactions, their previous knowledge and life experiences (Cerny, Amundson, Mueller & Waldron, 1996).

**e. Role playing** is a learning activity where students assume characters within a chosen context and carry out roles in the conduct of a predetermined scenario. Role playing is often used in educational contexts as a means to develop the affective components of a curriculum, for example students' beliefs and attitudes. In many business courses, role playing is used in such areas as counselling, negotiation training and learning about ethics (eg. Glass, 1999). Some instances of role playing take the form of games and are often referred to as simulations. In the context of this paper, we are principally concerned with the less structured forms of role playing.

Role playing is an open-ended learning environment and can involve the same high levels of learner activity and inquiry as other settings described earlier. Role plays are usually based around problem settings and in themselves tend to be problem-solving activities. Role plays are set within specific contexts and tend to follow a phased approach with learning occurring across a number of phases (Chesler and Fox, 1966).

## IMPLICATIONS FOR MAINSTREAM TEACHING

The learning designs that I have described above are discrete and recognisable entities. They represent forms for the design on any type of learning environment but are very well supported when used in online settings. There are many academics and teachers who are finding very effective ways to apply these design strategies in their classes in higher education. But for many the learning design is unknown and its potential for application in their classroom teaching is quite distant.

There are now a number of projects which are underway to make it possible for teachers to employ these forms of learning design in their own classes through online technologies. One particular project in which I am involved is an Australian Universities Teaching Committee Project which is exploring ways to create templates and generic designs for learning environments with learning designs of the forms I have described here. Many other agencies are now looking for ways to create reusable forms of learning designs and learning resources to foster and encourage the development of sustainable and effective online learning settings. Much of the research and development work in online learning is exploring issues associated with creating the means for mainstream teachers to seamlessly integrate new technologies in meaningful ways into the learning programs.

## SUMMARY AND CONCLUSIONS

This paper has discussed the nature of constructivist online learning environments and has presented a synthesis of contemporary thinking describing the attributes of settings that support knowledge construction. The paper has presented a model to inform the design of constructivist online learning settings and argues the needs for learning that is task-based and centred on open-ended and ill-structured activities.

A number of learning designs have been presented that have been found to support constructivist learning settings. These learning designs are being used more and more as the basis of the design for online learning. They provide a structure and framework for designers to follow which encourages the selection and creation of meaningful tasks as the basis for student activity. At the same time the various designs support the notion of authenticity in the tasks in terms of the nature of the tasks and the contexts in which they are set.

Whereas in the past we have seen the proliferation of Web-based learning settings that have consisted mainly of on-line content and online interactions between teachers and students, we are now seeing increasing application of the forms of learning design described in this paper. Much of the research in instructional technologies today is focusing on exploring ways to refine and modify these settings to discover the optimal forms of learning activity and engagement to support the transfer of learning from the classroom setting to the workplace or the setting where its intended use will be.

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# Online Portfolio Assessment in Information Systems

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## ABSTRACT

*The paper explores how portfolio-based assessment, particularly its online forms, can address some of the challenges presented by new trends in tertiary education in fast changing subject areas such as Information Systems.*

*Keywords: Information Systems, Assessment, Portfolios, Online*

## INTRODUCTION

The problem: How can university assessment methods be developed to meet new challenges and address contemporary assessment problems in the field of Information Systems?

Six trends in tertiary education indicate that university assessment methods need to be reviewed:

Increasing focus on 'outcomes-based' assessment of professional skills. This is strongly evident in Australia, the US and the UK, and echoing 'competency-based' assessment in other areas of education (see, for example, Australian Computer Society, 2001a, Australian Nursing Council Inc., 2000, ANTA/AVCC, 2000).

Increasing emphasis on graduate attributes (DETYA, 2001, DETYA, 1999) creating tension between existing assessment structures and those appropriate to graduate attributes.

High rate of change of knowledge especially in fields such as Information Systems (IS), Information Technology (IT), and some Natural Sciences (Australian Computer Society, 2001a).

Increased emphasis on employability as an outcome of university education (DETYA, 1999, DETYA, 2001).

Increasing problems with plagiarism and fraud fuelled by the ease of computer based editing and copying of Internet sources into assessment submissions (Terrell and May, 2001).

Pressure to improve assessment quality by improving the accuracy, focus and feedback of assessment processes (DETYA, 1999, Cooper, 1999).

Minimising problems associated with equity issues by making assessment equitable for all students (Cooper, 1999).

Disintegration of education processes and assessment because of increasing tendencies for units to be delivered by partner institutions, and marking to be outsourced (see, for example, Technology and Industry Advisory Council, 2000, Bradley, 2000).

**Outcomes-based assessment:** Increased focus on outcomes-based assessment changes the emphasis towards 'demonstrating the application of a body of knowledge' rather than 'knowing about' a body of knowledge. Different forms of assessment are needed for educational processes that focus on the skills and the practical application of knowledge in fast changing situations. Traditional assessment is less appropriate for this purpose because it was originally developed for assessment in:

Discipline areas in which the rate of change of knowledge is slow  
Societies in which the rate of social change is slow.  
Situations in which professional skills are acquired elsewhere

The trend towards outcomes-based assessment is found throughout education: in the university systems (Graduate Attributes) (DETYA, 1999, p 16, DETYA, 2001, p 32), in the school education system (Curriculum Council, 1998), and in the professions (see, for example, Australian Computer Society, 2001a, Australian Nursing Council Inc., 2000).

**Graduate attributes:** By definition, graduate attributes are skills that students have at graduation. Assessment modalities for graduate attributes cannot easily be integrated with traditional unit assessment processes where courses are modularised and where modules can be taken in a variety of different sequences. There is tension between existing university assessment structures and assessment structures needed for the assessment of graduate attributes because generic skills assessment crosses unit boundaries and existing assessment processes are focused around topic-based units.

**High rates of change:** In fast changing professional disciplines, such as IS, it is unsatisfactory to assess ability through the demonstration of detailed knowledge of content likely to be obsolete soon. Professional institutions such as the Australian Computer Society (2001a) regard it is more important for students and practitioners to:

Be able to demonstrate their understanding of fundamental concepts that underpin a discipline's knowledge  
Demonstrate their ability to learn and continually update their skills

Assessment of these skills is not usually regarded as a strength of traditional assessment modalities, which assess students' grasp of pre-defined topic information rather than their abilities to develop their knowledge and skills.

**Employability:** In fields of study in which knowledge becomes quickly obsolete, one-time mastery of a body of knowledge does not imply ongoing employability or continued professional competence (Australian Computer Society, 2001a). There is tension between education appropriate to a fast-changing knowledge situation, and the expectation that students completing a course should be immediately employable without further training. Pedagogically, it is complex but feasible to create educational processes that fulfil all these aims; helping students acquire a deep understanding of fundamental concepts, skills at life-long learning and continued professional development, and skills of immediate use in employment. Combining these educational processes presents assessment problems. These assessment problems are more easily resolved by portfolio-based assessment because the role of a portfolio as a 'container' allows the inclusion of different forms of evidence.

**Plagiarism:** There is increasing concern about levels of student plagiarism, especially in fields such as IS in which students have high levels of computer and Internet skills (Kearns, 2000). Portfolio-based assessment can assist in this situation by facilitating the triangulation of assessment. Traditional forms of assessment that do not co-locate individual assessments from different units do not offer a ready means for examiners to correlate standards across an individual student's multiple assessment items.

**Improving Assessment Quality:** Assessment processes are becoming increasingly subject to quality assessment and quality assurance processes (DETYA, 1999, Kemp, 1999). Improving the quality of assessment depends on a direct and transparent relationship between the aims of education and practicalities of assessment. In addition, improving assessment quality requires sound moderation between and across units, courses and institutions.

**Minimising problems associated with equity issues:** The shift to tertiary mass education has resulted in culturally, educationally, and socially more diverse student populations (DETYA, 1999). This significant reduction in homogeneity increases the potential for equity issues in assessment. Minimising equity problems is an important aspect of choosing assessment methods. Portfolio-based assessment can resolve many of these equity issues (Cooper, 1999).

**Disintegration of education processes and assessment:** Trends towards commercialisation, modularisation and globalisation in education have led to courses and units being delivered by partner institutions, and through flexible delivery modes including external study or Internet-based study, and with marking processes often outsourced to junior staff or postgraduate students (Technology and Industry Advisory Council, 2000, Bradley, 2000). Each of these factors reinforces the problems of traditional assessment processes and reduces the possibility for appropriate, effective, efficient, equitable, high quality assessment suited to professional education in fast-changing knowledge areas.

This paper argues that the above factors point to the need to review assessment processes. It uses Cooper's (1999, 1997) six-step model of portfolio-based education to show how portfolio-based assessment offers benefits over traditional modes of assessment in addressing the assessment challenges raised by these factors. The paper explores the role of professional accreditation in IS assessment and then concludes by discussing how online portfolio-based assessment can address the above assessment challenges.

## PORTFOLIO-BASED ASSESSMENT

Portfolio-based assessment is now well established as a valuable assessment tool (see, for example, Barrett, 2000c, Biggs and Tang, 1997, Cooper, 1997, Education Department of Western Australia, 2000a, Education Department of Western Australia, 2000b). Portfolio-based assessment is beneficial pedagogically because the format can encompass evidence from a wide variety of sources (Education Department of Western Australia, 2000b), it can help educators overcome many assessment difficulties, especially in relation to equity and moderation (Cooper, 1999, Cooper and Love, 2000), it provides a 'richer picture' of the student (Barrett, 2000c), portfolio-building actively involves students in the learning process (Bowie et al., 2000), and is valuable in supporting lifelong learning (ANTA/AVCC, 2000). For IS and IT related disciplines, online portfolios are especially appropriate (Bowie et al., 2000, Barrett, 2000c).

Cooper's (Cooper, 1999, Cooper, 1997) definition of a portfolio is:

**Portfolio:** Collection of evidence that demonstrates skills, achievements, learning or competencies.

Cooper's 'six step' portfolio building process is well established as a basis for planning and teaching outcome-based professional assessment in tertiary courses (see, for example, Cooper, 1997, Cooper, 1999, Cooper and Emden, 2000, Cooper et al., 1999, Cooper and Love, 2000). The six-step process ensures that portfolio-based assessment is applied in a purposive way that relates transparently and directly to predefined pedagogic processes and outcomes.

The portfolio-building process consists of:

Step 1: Identify the *areas of skills* that the student is intended to develop.

Step 2: From these skill areas, develop specific *learning outcomes* for the student to achieve.

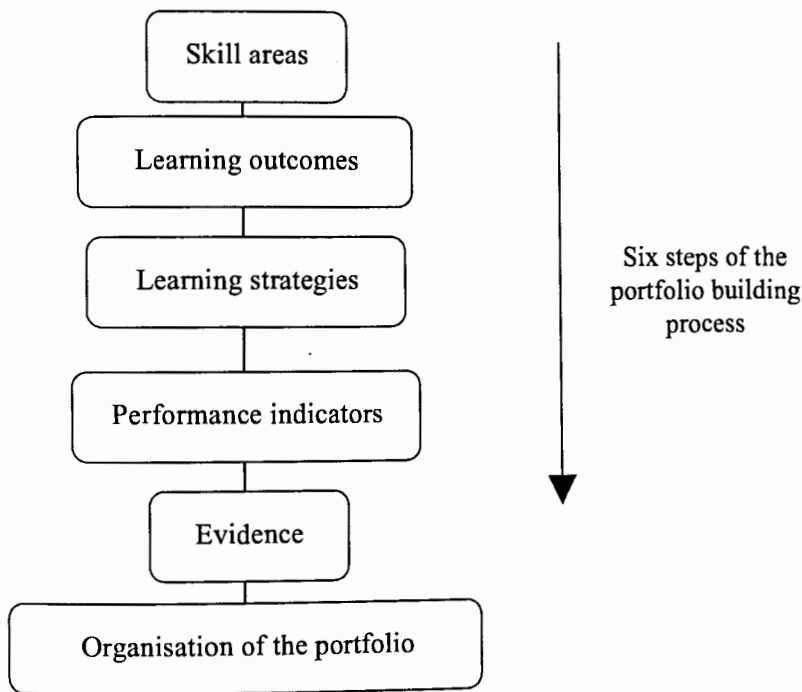
Step 3: Identify appropriate *learning strategies* for the student to achieve their learning outcomes.

Step 4: Identify *performance indicators* that establish the student has achieved their learning outcomes, and indicate the evidence the student needs to collect.

Step 5: Collect *evidence* that demonstrates the student has met the performance indicators.

Step 6: Organise this evidence in a *portfolio* so assessors can easily understand how the evidence relates to each performance indicator.

Visually, the sequence is:



Cooper (1999, 1997), copied with permission

The table below shows how the six step process might be applied in an IS context.

Six Step Process	Information Systems Course Design Issues
Skill area	Core skill areas determined by the pedagogic aims of the course, ACS requirements, and graduate attributes
Learning outcomes	Learning outcomes are either prescribed by the course outline, or individually negotiated with students after their level of expertise in each skill area
Learning Strategy	Learning strategies are suggested by lecturers, but ultimately the responsibility of each student
Performance indicators	Performance indicators are defined by course design, or discussed with students so that they understand how to make decisions about standards of performance relevant to key IS skills
Evidence	Students collect evidence of their skills and knowledge from a variety of sources including: marked assignments, references and testimonials, certified courses, external projects, employment
Organisation of portfolio	The portfolio is assembled and presented according to a predefined structure. This structure can be defined more or less completely. For example, it may consist of tables of contents, commentary relating evidence to performance indicators, and items of evidence. A more tightly defined portfolio schema might involve a rigid online template structure within which students enter evidence and explanations of the relationships of evidence to performance indicators. Background server-side processing then shapes how each portfolio is viewed by examiners online or in print.

Portfolios are either summative or formative, *summative* portfolios demonstrate learning outcomes while formative portfolios demonstrate learning processes. This paper focuses on summative portfolios, because professional accreditation such as that of the Australian Computer Society (ACS) is primarily concerned with final achievements rather than the students' learning processes.

Summative portfolio-based assessment has three main forms (Barrett, 2000c, Cooper, 1999):

- The competency based portfolio,
- The negotiated learning portfolio
- The biographic profile, or record of achievement.

In the competency-based portfolio, course outlines specify the learning outcomes for a student. In the negotiated learning portfolio, students negotiate intended learning outcomes. Competency and negotiated learning based portfolios can be combined into a hybrid approach for which the lecturer stipulates some compulsory learning outcomes and allows students to define additional learning outcomes relevant to their personal interests and future career directions. The biographic portfolio or profile is an expanded Curriculum Vitae that is not generally sufficient for assessment purposes because it is not usually related to performance indicators and specified learning outcomes.

Most students do not enter university with the skills necessary to plan their professional development or satisfactorily organise a professional portfolio. Experience in other disciplines has shown it is necessary to teach students these skills. The six-step portfolio building process above was developed for this purpose. Within IS curricula, this process can be taught in whichever unit focuses on developing students' lifelong learning skills to facilitate continued professional development.

## Information Systems assessment & professional accreditation

In tertiary IS education in Australia, the Australian Computer Society (ACS) is a key body for accreditation of courses and individuals. The ACS emphasises continuous professional development, and their accreditation of courses requires IS professionals to recognise their training needs and participate in devising suitable means of meeting those needs (Australian Computer Society, 2001a). They state that,

"Because knowledge about information technology is still expanding rapidly, it is important that IT professionals continue to learn throughout their careers. It should be both an employer and an employee expectation to undertake continuing education courses in various forms, either at academic institutions, through publicly available seminars and conferences, or the ACS certification scheme. IT professionals also should undertake studies in management or in the fields of application of IT that are relevant to their daily work, such as accountancy, business, or any other appropriate discipline."

As part of their university education, IS students should learn how to recognise their own training needs and how to satisfy them. The above statement from the ACS guidelines, acknowledges it is impossible for any undergraduate course to adequately prepare students for all possible IS/IT careers.

The ACS syllabus (Australian Computer Society, 2001b) identifies the following skills as fundamental in information fields. The ACS require that students must:

- "Understand the need for and the importance of information in an organisation"
- "Understand the need for data integrity and security and the means by which these may be obtained"
- "Understand the components which comprise the information technology infrastructure in the organisation"
- "Understand the processes involved in problem-solving and the methods used for developing computer-based Information Systems"
- "Understand the essential features of the hardware and software data management and data communications components of computer-based Information Systems"
- "Understand the ACS code of ethics as an example of such occurred required by professional society"

This demonstrates an explicit focus on generic fundamental skills that avoids assessing students' skills at using proprietary computer languages or applications because they are subject to rapid change.

The ACS approach aligns well with portfolio-based assessment because it provides a medium for students to collate evidence of fundamental skills over a wide variety of contexts. Students can organise their portfolios around mandatory areas such as those defined in the documentation of their courses and the syllabi of the ACS. They can choose additional skill areas, such as those outlined in the optional ACS examination syllabus, and graduate skills relevant to IS/IT in the graduate attributes list. If students undertake specific professional training during their degree, they may wish to include in their portfolio any relevant proprietary certification. Students may also choose to supplement their portfolio according to their personal interests or future career goals. This helps students to build skills to manage their own professional development. Online portfolio based assessment is very appropriate in developing the skills required for ongoing professional development such as that required by the ACS, because the medium provides an authentic assessment opportunity where students can demonstrate their skills (Barrett, 2000b).



## Online portfolios

Online variants of portfolio-assessment offer several additional practical advantages to those of hardcopy portfolios (Barrett, 2000a, Cooper and Love, 2001) because they:

- Are easy to backup /store
- Have good portability
- Allow multiple simultaneous access by examiners
- Have good shelf life.
- Allow the ready inclusion of dynamic cross-referencing of documents
- Can include cross-referenced multi-media presentations
- Offer the means of automating many routine tasks undertaken by lecturers and admin staff.
- Open the way to automating several aspects of marking, initially in the areas of grammar and spelling

## ONLINE PORTFOLIOS & EQUITY

Online processes for creating and assessing portfolios depend on technology, and students' technology skills. Potentially, these dependencies may have a significant and adverse affect on assessment quality by reducing equity. Access to technology to build online portfolios is not ubiquitous. In some cases, it is tied to the socio-economic status of individuals and institutions. To reduce equity problems the portfolio format should be specified so as to avoid disadvantaging students because of lack of access to hardware or software. This minimises students being unfairly disadvantaged through limited access to more sophisticated software.

Barrett (2000a) separates *electronic* portfolios into different categories on the basis of the levels of skills, hardware and software needed. 'Electronic' portfolios, for Barrett, include 'any electronic representation' such as video and audiotapes, and are not necessarily computerised. Barrett's categories are outdated by technology changes, but her approach is useful for categorising modes of online portfolio assessment. The categories provide the basis for choosing technology platforms and presentation specifications to minimise equity issues.

Most equity issues for online portfolio assessment that are caused by technological issues can be resolved by limiting the technologies that can be used to a common framework. This can be done, for example, by the use of online templates designed to work with a set of standardised hardware and software that is available to all students, and in which all students are trained. This limits the scope for more affluent students to gain assessment advantage through access to more sophisticated software.

## ONLINE PORTFOLIOS & PLAGIARISM

Computed-aided plagiarism is an assessment problem for student work submitted in both paper-based and online formats where online access and computers are available (Kearns, 2000). Lecturers cannot easily address the plagiarism problems that the Internet presents using traditional approaches. Recent experience, anecdotal and reported, indicates plagiarism is a serious assessment concern (for example, Terrell and May, 2001). Suspicions about plagiarism undermine confidence in assessment procedures, and negatively affect the reputation of the examining institution. This provides pressure for cases of plagiarism to pass apparently undetected or be resolved without publicity, increasing the level of suspicion. New forms of addressing plagiarism are needed.

Assessment by online portfolios facilitates the detection of plagiarism. New technology means electronically submitted student work, especially structured submissions such as online portfolios, can be automatically scanned for plagiarism. Recently developed software from Glatt, iParadigm, IntegriGuard and others (IntegriGuard.com, 2001, iParadigms.com, 2001, Plagiarism.com, 2001) offers a means to test for plagiarism in electronically submitted documents. Glatt's program, using cloze

theory and the uniqueness of each individual's writing 'fingerprint', claims to detect plagiarism where it would not have been detected by manual systems without producing 'false positives'. This is an important consideration given the seriousness of plagiarism. This process can be applied to hardcopy but is easier where documents are electronic. This offers a significant improvement in strategies for reducing plagiarism, and maintaining credibility in assessment processes.

## ONLINE PORTFOLIOS AND FRAUD

In IT courses, the opportunities for fraud may represent a particular temptation for some students because they have access to equipment and expertise that facilitates fraud. It is easier to alter undetected an electronic copy of a certificate or electronic reference than to credibly alter an original hardcopy.

Tampering with electronic evidence is a serious issue. It falls under university misrepresentation regulations in the same way that applicants who lie about qualifications are subject to a summary dismissal if their lie is discovered. Fraud in evidence invalidates a portfolio in assessment terms, and should lead to severe penalties including possible exclusion from the university.

The triangulation facilitated by portfolio assessment offers some protection from assessment fraud where gross differences in skill level are evident. Currently, there are emerging standards in online certification of documentation. The main weakness that remains is in the processes of converting paper-based documentation into electronic form. In terms of quality assurance processes, one way addressing this issue is for students to sign a declaration that they have the original evidence on which electronic portfolio submission is based, and that they have not in any material way altered or edited certification, references or evidence provided by other people and included in the portfolio.

Server-based security is well developed and there are several fraud-hardened approaches to assessment certification possible. For example, external and associate examiners can enter marks or competency certification using web-based password protected forms that use secure server-side scripts to place an authenticated certificate in a student's online portfolio container.

## ONLINE PORTFOLIOS – GRADUATE ATTRIBUTES

Online portfolios offer an efficient means of demonstrating and assessing graduate attributes. Portfolio based assessment uses a combination of performance criteria and evidence. Graduate attributes provide an additional set of performance criteria and can be included in portfolio assessment processes in a similar way to other performance criteria. Up to final assessment, any evidence that a student collects to satisfy unit-based performance indicators may be also presented as evidence that they possess graduate attributes. This removes the need for a separate graduate assessment mechanism and minimises the need for students to prove that they possess particular graduate attributes.

## SUMMARY

This paper presents a strong argument for the inclusion of online portfolio-based assessment in IS education (alongside other assessment strategies) to resolve identified challenges due to changes in tertiary education environments. Online portfolio-based assessment offers efficient and effective ways to include graduate attributes, quality assurance processes, and professional certification. It offers the basis for addressing equity issues and controlling plagiarism and fraud, it provides students with an authentic opportunity to demonstrate their ability to use software and hardware on a real task, perhaps most importantly, it help students to develop skills that enable them to plan and documents their own continued professional development. This skill is essential to IS students as future professionals.

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# Jurisdiction: How does it affect e-commerce - strategies for virtual organisations

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## ABSTRACT

*The long term success of business to consumer e-commerce depends, in large part, on the existence of satisfactory supporting legal infrastructures coupled with the implementation by virtual organisations of appropriate strategies that will achieve optimum business protection, consumer trust and legal compliance. The concept known as 'jurisdiction' is gaining in significance in the world of e-commerce. The purpose of this paper is to explain why it is that jurisdiction impacts on all the players involved in e-commerce and to explore strategies that could be implemented by virtual organisations that might eliminate, or at least reduce, the associated risks.*

## INTRODUCTION

Public discussions of electronic commerce...centers around global electronic commerce as a fait accompli, a done deal...But the realities of the situation...are far different from the public perception. Many serious issues are unresolved, fundamental issues such as legal and political infrastructure... A corrective is...needed to focus attention on what still needs to be done before the dreams of global electronic commerce can be realised. (Dekleva, 2000, p 3)

Whilst there is little doubt that business to consumer electronic commerce is viable and the market is growing (Larsen, 1999), the underpinning foundations are not yet secure for many reasons. Amongst those reasons, legal issues are prominent. Relevant legal issues could canvass such varied fields as on-line contracts and the validity of electronic contracts, confidentiality, privacy, intellectual property, defamation, censorship, taxation, payment systems and consumer rights. It has been suggested that an attendant lack of resolution and/or lack of clarity represents an ongoing constraint for global e-commerce and that the ultimate success of e-commerce in both the developed and the developing worlds depends, in part, upon the successful resolution by governments and/or virtual organisations of these issues. (Clinton & Gore, 1997, OECD, 1998 and WGEC, 1998).

The current legal structure has perceived weaknesses both from the perspective of the trader and from the perspective of the consumer. As to the consumer, privacy and consumer rights are considered to be prominent issues. As to the trader, the validity and enforceability of electronic contracts and jurisdiction are considered to be prominent issues. It is only possible within the limitations of this paper to consider one of the prominent issues, and that is the issue of jurisdiction.

"Jurisdiction" is a word that has had significant meaning and influence in the offline world for hundreds of years. The problems posed by jurisdiction are not problems created by the Internet and electronic commerce. The global and seamless nature of the Internet has simply added to or compounded the problems as Internet e-commerce (whether it be business-to-business or business-to-consumer) expands and increasingly gains the confidence of the commercial and consumer sectors.

Whilst one could mount compelling arguments in support of the view that territory based laws based on arbitrary borders are inappropriate in the world of e-commerce disputes (Johnson & Post, 1996; Jew, 1998), nevertheless such disputes are almost entirely determined according to traditional concepts of territory based laws.

A major Australian study came to the view that "e-commerce may result in the creation of a single world economy even though individual corporations may operate in a national or regional setting" (AUSTRAC Report, 1999).

Whilst international courts (such as the International Court of Justice in the Hague, Netherlands) may play a meaningful role in the resolution of inter-country disputes, such courts have little real power or control (let alone enforcement ability) in the area of e-commerce disputes. Individual countries remain reluctant to relinquish their so-called "national sovereignty".

Anyone involved in international e-commerce or interstate e-commerce must have an appreciation of the applicable legal regimes.

## **JURISDICTION IN THE E-COMMERCE SECTOR**

Jurisdiction can mean many things depending upon the context in which the word is used. Jurisdiction can refer to the limitations on the rights of certain courts to hear certain disputes. As an example, an industrial dispute will not be able to be heard by the Family Court for it is not the appropriate jurisdiction. Similarly, a motor vehicle accident claim involving personal injury must be instituted (in Western Australia) in the District Court because that is the appropriate jurisdiction. When one comes to the world of commerce, jurisdiction takes a slightly different meaning. In basic terms, it refers to the right and ability of a court to hear and determine a dispute. As an example, a business (based in country A) may well place an order on the net (using his or her local ISP) for the purchase of a quantity of goods with an online supplier (based in country B). The supplier will receive the business 'order' (using his or her local ISP) and may well, in turn, place an appropriate order for purchase and direct shipment to the business in country A, with a manufacturer (based in country C) who receives and confirms the order using his or her local ISP. If the goods subsequently do not arrive, arrive late, or arrive (with the business based in country A) damaged or faulty and, assuming that negotiations to resolve or rectify the problems cannot be successfully concluded, where and between whom is the dispute to be taken? In other words, which is the appropriate jurisdiction to hear and resolve the dispute?

To reduce the question to a basic level, if you purchase a CD over the internet from a merchant in Singapore, will the law apply as if you had travelled to Singapore and bought the CD there, or as if the merchant had travelled to Australia and sold the CD to you here?" (Cameron, 2000, p 14)

Before proceeding to consider the approach taken by some of the courts of various countries to this question, three comments need to be made. Firstly, if a plaintiff (the person taking the action) cannot convince the court in which he or she initiated the action that it is the appropriate forum, then the case will not even get off the ground, and the substantive issues involved in the dispute will become irrelevant - what a waste of time, money and resources that could be! Second, even if the court is satisfied that it does have jurisdiction to hear a case, it may decide, for various reasons (such as cost, convenience and the interests of justice), that it is more appropriate to send the matter for hearing to the courts of another country. Thirdly, even if the plaintiff does select and satisfy the court that it is the appropriate jurisdiction, and assuming that the action is successful and an order such as damages in favour of the plaintiff is made by the court, the enforcement of the court's orders by the plaintiff may be problematic especially when one considers a defendant (the person who is being sued) who is based in another jurisdiction. On the other side of the coin, a business that chooses to ignore a 'foreign' judgement issued against it may well be adopting a very dangerous business judgement. These issues will be returned to later in this paper.

## THE US APPROACH

Whilst the decisions of US courts may not be binding on Australian courts, they are certainly useful and influential and may provide guidance to the future likely approach to be adopted by Australian courts.

It is true to say that most of the decided cases relating to e-commerce disputes have been decided in the courts of the United States. In many of those disputes the defendants (who in most cases have been the trader or merchant) have raised, as starting arguments, that the court in which the defendant has been 'forced' to defend himself or herself does not have jurisdiction to hear the case and that the courts of another place are more appropriate. The reality is that a defendant would prefer that the case did not exist in the first place but, given that it does, the defendant would prefer the case to be heard in his or her 'preferred' jurisdiction which usually will be the place where his or her business is principally located. A case run in your 'preferred' location will be more convenient, probably cheaper and certainly disadvantageous to the other party who is based outside the jurisdiction and who does not have local knowledge or contacts.

Mention must also be made of the fact that in most areas of law, the various laws of a US State are governed and determined by the legislature and the courts of that US State. Accordingly, the laws and, in turn, the views of the courts with respect to jurisdiction can vary and the courts, unfortunately, have not always spoken with one consistent voice. This is not a problem isolated to the US, it is a worldwide issue of concern to which no apparent near future answer is available.

In the US, as a guiding principle, a court in one State will 'take' or exercise jurisdiction over a willing or unwilling defendant from another jurisdiction if the plaintiff is able to prove that the defendant has had the 'required minimum contact' with the plaintiff's chosen jurisdiction in such a way that the justice and fair play cannot be seen to be offended. What then is 'required minimum contact'? The answer to that seems to be that the defendant has 'purposefully availed' himself or herself of the privileges of doing business in the plaintiff's State in such a way that the defendant should reasonably expect, in the event of dispute, to be brought before (hailed before) the plaintiff's State courts to resolve the dispute. In other words, the defendant has taken the benefits of doing business in the State.

Whilst it is easy to use words such as 'required minimum contact' and 'purposeful availment' it is much more difficult to determine, in any given fact situation, whether the tests have been satisfied. One needs to look at the quality, quantity and nature of the defendant's contact with the State and perhaps the best way to understand the guiding principles of the US position is to consider some e-commerce cases (all of which have been decided in the last few years) that required the courts to consider and resolve the question of jurisdiction. Before looking at these examples, it is worth noting that the nature of the underlying cases (being based in, say, copyright law or trademark law or patent law) is of no concern - what is of concern is the resolution of the issue of jurisdiction. Once a court accepts its right to hear the case, the case proceeds - if it does not so accept, the case needs to be dropped or transferred to the appropriate jurisdiction.

In the first example, the defendant, based in State A, was sued for trademark infringement in State B. The defendant had no offices or employees in State B, nor did it regularly carry on business in State B. The defendant had Internet advertising and a toll free phone number which could be accessed by all Internet users. Residents of State B had accessed the advertising and used the toll free phone number. The court of State B decided that it did have jurisdiction and the case proceeded against the defendant's wishes (*Inset Systems*).

In the second example, the defendant based in State A was sued for trademark infringement in State B. The defendant's website (hosted in State A) contained a link that, if activated by a user, would automatically send more information to the user. Residents of State B had accessed the website and activated the link. The court of State B decided that it did have jurisdiction and the case proceeded against the wishes of the defendant (*Maritz v Cybergold*).

In the third example, a defendant, based in State A was prosecuted in State B for offering illegal gambling. The defendant had a website (hosted in State A) which advertised the future intention to operate an offshore online gambling service. The site provided a toll free phone number for further information but did warn users to ensure that they complied with their State's legislative provisions. Residents of State B were in contact with the plaintiff. The court of State B decided it did have jurisdiction and the case proceeded against the defendant's wishes (*Minnesota v Granite*).

What do the first three examples suggest? It is suggested that to satisfy the 'required minimum contact' and 'purposeful availment' tests not a lot of Internet contact is required. Access to a web site, the provision of Internet accessible advertising, the provision of toll free numbers for further information, the provision of links accessible

for further Internet information, coupled with the reality of access, may all collectively or perhaps independently of the examples enunciated above even involved the active creation or attempted creation of an online contract and presumably, if that had been the case, the finding of jurisdiction could even more easily have been made.

This assumption is supported in another case where a defendant was based in State A and had an Internet Service hosted in State A, but many residents of State B had joined the defendant's site as 'fee for service subscribers'. The defendant had no office nor employees in State B. Jurisdiction in State B was found in a trademark infringement case (Zippo Manufacturing).

A word of caution on the US position needs to be made at this point. Not all the cases have found jurisdiction to the detriment (or perceived detriment from the defendant's point of view) of the defendant. In a fourth example, called "The Blue Note". The plaintiff was based in State B and had the trademark in State B for the same words for his jazz club. The plaintiff sued in State B for trade mark infringement but the court in State B declined jurisdiction because the defendant site made no sales (contracts) in State B, the defendant's site stated that it had no association with the plaintiff's trademark, and if a user was to ring the phone number provided by the defendant's website, the tickets would be issued but could only be collected from the box office in State A (Bensusan Restaurant).

One final (fifth) example is especially worthy of mention. In this case the defendant was based in State A but did have some other online business in State B. The defendant's subsidiary 3 (a company called Y) operated an offshore gambling casino website from a server based in country C, which was properly licensed by country C. The gambling website did target US residents many of whom could, of course, be residents of State B.

Because Internet gambling is illegal in some US states (including State B) the site required intending users (before they could effect any gambling transaction) to electronically input their residential address and the site was configured in such a way that if a nominated residence was entered from a potential user from a 'barred' state, that user was prevented from proceeding to effect betting transactions. The defendant was sued for a contravention of State B's antigambling laws. Considering the above facts, a strong argument can be mounted; firstly that any gambling that was done by residents of State B was offered to them by Company C not the defendant; secondly that the gambling was being effected 'offshore' and not in State B; and thirdly, that any bets placed by residents of State B were received innocently and without intent by the defendant (or if you like Company C) because of the installation of the address filtering software on Company C's site. None of these arguments persuaded the court of State B to decline jurisdiction. The court found that the defendant conducted business in State B, the defendant actively sought the business of the residents of State B, that Company Y and the defendant were in reality one and the same, that there were State B gambling users of the site, the gambling by State B residents took place in State B and, perhaps most importantly, that the mere use of address filtering software (without further checking and verification) could too easily be avoided and accordingly did not provide a compelling argument as to the question of jurisdiction (People v World Interactive).

## THE AUSTRALIAN APPROACH

The approach of the Australian courts to the issue of jurisdiction is slightly different to that adopted in the US. Notwithstanding the differences it is suggested that the end result (ie the finding of jurisdiction or otherwise) will usually be the same. Unfortunately in the area of e-commerce, there is a dearth of cases in Australia that have needed to canvass or resolve jurisdictional matters. Nevertheless, the non-e-commerce Australian position in this area is worthy of mention. As a starting point to establish jurisdiction, the defendant must either agree to accept the jurisdiction of the nominated Australian court (and if he or she does so, then no further jurisdictional problems will usually arise) or, in the absence of acceptance, the plaintiff must be able to establish that service<sup>4</sup> of the court proceeding has been made upon the defendant. Under Australian court rules, service out of the jurisdiction is possible but often requires the leave (permission) of the court in question. If a defendant is not 'served' with the papers, it would generally be an affront to justice to proceed in his or her absence because he or she would, unaware of the court hearing, obviously be unable to enter a proper appearance and defence. Given that service is properly affected, then still an Australian court will only hear a case, that is within its limits, if

3 A subsidiary is a company that is controlled by another company (usually called its holding or parent company) but the subsidiary (in traditional Corporations law) is a separate company with a separate existence in its own right

4 Service means proper and adequate delivery (usually in person)



there are sufficient connecting factors between the court and the subject matter of the dispute and/or the parties to the dispute.

It is not that long ago that people could be heard to say that when you are deciding jurisdiction on the web, that jurisdiction is to be determined by the location of the server. As an example, if music is downloaded in Switzerland using a Swiss server, then the law to enforce infringement would be Swiss law. It was not long before the courts (all around the world) realised that such a restrictive view was inadequate and led to arbitrary results not necessarily leading to justice and, indeed, in many cases leading to the opposite result - the avoidance of justice. Whilst the location of the server remains one factor to consider, it must be considered as part of the whole picture. Other matters to be considered (none of which in isolation may be sufficient to create a finding of jurisdiction) include the places of residence of the disputing parties, the places of businesses of the disputing parties, the place of the offending conduct, the place of the transaction, the location of the computers that access the offending material, where the goods and services emanate from and are delivered to, in what way was the payment effected and in which currency was payment made, and so on.

## **STRATEGIES FOR REDUCING OR MINIMISING THE RISK**

At the outset it must be made clear that even the most careful and prudent business person taking all or any of the steps that are suggested below may unwillingly find himself or herself brought before a court in another state or a foreign country to answer a claim relating to an e-commerce/Internet/web based transaction, contract or conduct of some form. Nothing in this area is foolproof but some of the following strategies may assist and require little energy or effort to implement.

The first obvious suggestion is that if you are involved in the offering via a website of online contracts (or indeed if you are negotiating any contract including a website development agreement) you should prominently include within the contract a jurisdiction clause. Don't forget that you, as the merchant, are in the driving seat here as you will be in a position to nominate (if done properly) the terms and conditions as to which the consumer has very little opportunity to amend or object. The clause (as long as it is seen as part of a valid and enforceable contract) need not be complicated but it should be clear, obvious and well written. The clause should state that in the event of any dispute of whatsoever nature, the dispute will be governed and determined in accordance with the laws of say, Country X. Care must be taken to ensure that the other party has adequate notice of the terms and conditions (in this case, the jurisdiction clause) prior to the entry into of any arrangement or contract.

Further, the clause should also state that the appropriate courts of Country X will hear the dispute. This extra step is a worthy addition because it is possible, albeit in rare circumstances, for the courts of say Country Y to determine a dispute according to the laws as they apply in Country X. This is not the outcome you were trying to achieve! In countries which have their laws partly or totally broken up into regional or states based law, it would be wise to nominate that the laws of that state (rather than the country as a whole) should determine the dispute. This would hopefully avoid the problem of say a Western Australian company being brought to account before say, a New South Wales court.

An example of a clause (without giving you legal advice, which you must obtain as the need arises) might contain words akin to the following:

This Agreement shall be governed by and construed in accordance with the laws of [insert your country or state]. All aspects of all actions brought relating to the subject matter of this Agreement shall be governed by [your country or state] laws. The parties hereto hereby consent to the exclusive jurisdiction and venue of the Courts of [your country or state] for any action that may be brought in connection with this agreement.

As previously mentioned, the insertion of such a provision into the contract or arrangement does not necessarily guarantee the success or enforceability of the provision. As an example, under the Australian Trade Practices Act, 1974, certain consumer protection provisions may not be excluded by providing for a foreign law as the governing law of a contract.

Another strategy that you could employ is to expressly exclude from your sites, sales to, or contact with, the residents or businesses based in certain countries. Customers must, of course, be required to identify their country of origin. You may choose to adopt this approach because you may either feel uncomfortable or unfamiliar with the laws enunciated in those countries or because the courts of those countries have adopted (in your view) an over-enthusiastic willingness to accept jurisdiction in disputes. It perhaps goes without saying that the negative side to adopting such an approach is the potential loss of trade or business opportunity. That is a judgement you will need to make.

Another strategy (closely aligned to the last one) is to limit within your site or otherwise, the target markets to the residents or businesses of certain nominated countries. In this way you can better have an understanding of the applicable laws in those nominated countries and feel more comfortable with issues pertaining to disputes and jurisdiction.

A final suggestion (where that is possible) is to limit the interaction offered by the site. Cases already discussed within this paper suggest that a 'passive site' will be less likely to lead to a finding of jurisdiction. As previously indicated, no strategy is foolproof so perhaps the best approach is not to get into dispute in the first place - perhaps easier said than done!

## CONCLUSION

The potential problems associated with jurisdiction online and offline are not going to go away. It is unlikely, in the foreseeable future, that the Courts of various countries, or indeed the courts of the States within countries, will speak with one voice. Any business and, in particular, any virtual organisation, should consider the risks inherent in the issue of jurisdiction. If you are conducting business across country borders or across state borders, you might take the view that you can ignore the proceedings taken by a plaintiff in a 'foreign' court because you are far away and the plaintiff cannot touch you at home. Such a simplistic view can be an extremely unwise view. If you want to continue to do business with the plaintiff or indeed with any other person within the plaintiff's country or state, an outstanding court order can pose grave risks to your business and your assets. Blocking of access to your site, injunctions, seizure orders, damages, credit downgradings and penalty orders are all possible depending upon the prevailing circumstances. It is even possible for some of the orders of a foreign court to be registered and enforced in a second country following acceptance of the orders by the second country's courts.

Consideration should perhaps be given to the recent (Nov, 2000) court order imposed on Yahoo!.com by a French court. Yahoo will want to do all it can to comply with the court order because it obviously wants to continue to do business with the French business and consumer markets who have voraciously embraced the world of e-commerce. Accruing pecuniary penalty orders are not good for the bottom line or business image. In this case, Yahoo was ordered by a French court to block access by French citizens to its US hosted auction sites because the sites contained close to 2000 Nazi related memorabilia objects and under French law it is illegal to display or sell such race based materials.

Whilst the French court gave Yahoo three months to find a way to block French citizens from accessing Yahoo's auctions, the effect of the order is that French law has effectively been imposed on an international corporation running its business (from a US server) in the US. Any ongoing breaches of the order could result in fines of up to \$25,000/day for non-compliance. Is this the end of the free net as we know it? Will Yahoo be forced to devise or install software that will prevent browsers from accessing their sites every time one of their sites happens to contain an item that could lawfully be sold in the US (and in many other countries), but not in France? (Glater, 2001).

In conclusion, an awareness of the laws of the countries with whose citizens or business you deal is helpful. If you are trading across many jurisdictions that may be nigh on impossible. Adopting some of the strategies suggested in this paper may assist. If you are ever faced with proceedings in a court that is 'foreign' to you, do not ignore the proceedings because (in the absence of a proper appearance, defence and argument) you are likely to be at the receiving end of a court judgement issued against you.

It can fairly be concluded that while it is unlikely that an Australian e-business setting up a website hosted in Australia will be open to jurisdiction in every place where the website is available, if the website actively solicits business in the other forum inviting the purchase of products or services then this would probably be sufficient to place an e-business under the jurisdiction of the other state of country... (Cameron, 2000, p 20).

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## END NOTES

<sup>1</sup> A subsidiary is a company that is controlled by another company (usually called its holding or parent company) but the subsidiary (in traditional Corporations law) is a separate company with a separate existence in its own right

<sup>1</sup> The approach adopted in Australia is largely the same as that applies in countries whose laws are historically based on the British system

<sup>1</sup> Service means proper and adequate delivery (usually in person)

<sup>1</sup> This clause is given for information only. All warranties or representations, express or implied, and of whatsoever nature, with respect to this clause are disclaimed.

# E-Government And Government Policy Towards The Internet

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## ABSTRACT

*This paper draws on the author's experience as the UK Government's first "e-envoy" to bring out lessons in three areas. First, on the scale of change required within government to deliver online services. Second, on the efforts needed to set up successful online forums or consultations. And third, on the need to avoid the overall policy framework being overshadowed by action to counter threats posed by the internet.*

*Keywords: e-government; internet policy*

## INTRODUCTION

The author was appointed as the British Government's first 'e-envoy' in September 1999, following recommendations in 'e-commerce@its.best.uk' (Performance and Innovation Unit 1999). This paper does not attempt to cover every aspect of Government policy towards the internet, which covers a huge agenda—set out, for example in the Annual Report by the E-Minister and E-Envoy (Office of the E-Envoy 2000). Instead, it concentrates on three areas.

First, on e-government, where much has been written about the radical shift in approach to service delivery that will be required, but less about how such a shift can in practice be brought about. Experience so far serves to highlight the scale of change necessary to achieve the full potential of e-government.

Second, on e-democracy, where the internet offers unparalleled opportunities for communication and consultation. But getting useful results requires considerable effort to set up suitable processes and systems and to avoid new channels being swamped with 'noise'.

Third, on the dark side of the internet such as trading in child pornography, exchange of terrorist information, unregulated gambling and financial scams. Governments need to work together to counter these threats—but at the same time need to avoid booby-traps and stop action in these areas hijacking their wider agendas.

## E-GOVERNMENT

The vision for e-government is clear and compelling.

It can provide services in a form that customers want. People are increasingly using the internet for private sector services and expect government to offer the same facilities.

It can enable services to be provided more efficiently and cost-effectively, so that the government can secure savings—which can be used either to enhance other services or other channels of delivery, or to reduce taxes.

And it can enable services to be provided in a more joined-up way, so that people can access government services in a way that makes sense to them, rather than one dictated by the structure of government departments and agencies.

Many Governments around the world have now set targets with the objective of getting all or most government services online. The UK has a target of getting all services online by 2005; Australia, of getting 'all appropriate Federal Government services online' by 2001; Canada, of getting 'all key Government services fully online' by 2004. There are similar targets, with slightly different formulations and dates, for other countries ranging from the US to Hong Kong (Office of the E-Envoy 2001a).

Achieving these targets will raise a variety of technical and technological issues. Many government services are large and complex operations, and moving to online delivery will require substantial investment to update existing IT systems. Managing such projects will in itself raise challenges for Government (Cabinet Office 2000).

The particular issue raised in this paper does not, however, relate to the technology—where the problems are reasonably well understood, even if still hard to handle. What this section instead focuses on is the problems of organising and managing cross-government initiatives.

This relates in particular to the third component of the e-government vision set out above: to enable citizens to access government services in a way that best meets their needs, rather than in a way dictated by organisational structures within government. This represents a major challenge for government. Services have traditionally been delivered via departmental 'silos', and moving towards more joined-up Government presents considerable problems of organisation and accountability. Although many authors have recognised this as an issue, the extent of the change needed has not often been brought out.

An example from the UK illustrates the scale of the challenge. The government has recently developed and set up a portal 'UKonline' (<http://www.ukonline.gov.uk>). This aims to be a single point of access for those wishing to use Government services online. The framework includes a series of 'life episodes' – initially 'having a baby', 'going abroad', 'dealing with crime' and 'moving home', with five more being added subsequently. All these involve more than one department or agency.

In developing the four initial life episodes, a team of consultants brought various stakeholders together from departments, agencies and in some cases from outside government. They held a series of brainstorming sessions designed to flesh out what might be included in each life episode. The result was a useful aggregation of information relevant to each life episode, organised and indexed in a way designed to make it easier for people to find what they wanted on a particular topic without having to wade through several different departmental web sites. It consisted mainly of information and links to other sites, both in government departments and outside government. There were relatively few transactions enabled initially, though these will be added as they become available.

It might be thought that this should have been a relatively simple task. The reality was that organising how this should be done was much more complicated than had been foreseen. The biggest issue was a management one. Who should take overall responsibility for setting up and maintaining each life episode? Much of the initial work was done from the centre, partly by the e-envoy's office and partly by the company who had won the contract to develop the portal. But it was expected that a lead department would take over the role once the initial concepts had been developed—the Department of Health for 'having a baby', the Home Office for 'dealing with crime' and so on.

The reaction of Departments varied. In most cases, they were willing on an ad hoc basis to undertake the work necessary to get a life episode set up, but were reluctant to commit themselves to take full ownership, and responsibility for making sure the information provided was correct and up-to-date. Some argued that they had not been tasked or resourced to take on this co-ordination role, or to ensure that information that was not 'theirs' was updated when necessary. It took considerable high-level management effort to get lines of responsibility agreed.

This in itself may seem a relatively trivial bureaucratic squabble. But it serves to highlight some of the difficulties inherent in implementing e-government. The ultimate vision of seamless access to a personalised mix of service from different departments is going to require considerable management and organisational effort, quite apart from any technical difficulties.

This is all the more true when different tiers of government are involved. In the UK, another issue that caused considerable problems was organising content applicable to people who lived in Scotland, Wales or Northern Ireland. This involved negotiations with the devolved administrations in those countries, who were keen to be involved but understandably protective of their particular interests. In a similar vein, bringing local authority services within the scope of the portal introduces yet another set of issues: different authorities are at very different stages in introducing online services, and have a range of different IT suppliers and contracts.

These are not issues unique to the UK. The challenge is widely recognised by governments in other countries too. The international comparisons in "Benchmarking Electronic Service Delivery" (Office of the E-Envoy 2001a) drew out the following comments, most in somewhat coded language:

**Australia:** 'It is difficult to change service delivery models across the whole of government. ... There is a crucial balance to be struck between collaboration and leadership. Building a collaborative approach to customer service delivery is a fundamental reform that will take some time to achieve, but is essential in the online environment.'

**Finland:** 'The development of cross-governmental services and their integration with back-office services is a difficult task. The Finnish Government is only just beginning this process.'

**Hong-Kong:** 'e-government is the transformation of government, not merely the implementation of technology. Changing the mindset of the civil service from a traditional department-centric thinking into a customer-centric and user-friendly approach requires the effort of every individual civil servant.'

**Netherlands:** 'Co-operation between government departments is a pre-requisite for e-Government.'

What is crucial is that Governments take appropriate action to overcome the hurdles. In the UK, for example, all departments are now required to produce e-business strategies, which must include 'an outline of how services will be joined up through effective links with other organisations delivering related services to similar customers' (Office of the E-Envoy 2001b). This is being backed up with a toolkit to provide practical support to departments in re-engineering the delivery of Government services around the user (Office of the E-Envoy 2001c).

In addition, the Government Gateway (<http://www.gateway.gov.uk>) is providing a single authentication service for Government departments, which will enable joined-up transactions between different departmental legacy systems.

## E-DEMOCRACY

E-democracy covers a wide range of topics, but the particular aspect addressed in this paper is the use of the internet to provide enhanced communication between citizens and elected representatives and between citizens themselves.

The internet has not yet lived up to its promise in this area. It has worked well in increasing the information provided *from* governments and elected representatives *to* citizens. But it has worked much less well in enabling citizens to express their views *to* governments or elected representatives. Although many government departments, agencies and individual elected members have published email addresses and set up online forums, these have mostly had only a marginal impact on the policy debate or on policy decisions.

In part, this is because of a lack of appreciation of what is required to organise online discussions or consultations successfully. Simply setting up a forum and opening it to all-comers is most unlikely to be successful. Such forums tend to become fragmented and to be dominated by a few individuals who feel strongly about particular issues. At the same time, it is often unclear whether departments or agencies have a policy of monitoring and responding to comments in the forum, and this can rapidly lead to disillusionment among participants. Moderation of forums can itself raise problems: if it is seen as stifling discussion, that in itself can become the focus of debate.

Running successful online consultations is time-consuming and resource intensive. But if done properly it can be rewarding. In the UK, the Hansard Society has undertaken online consultations on domestic violence (Coleman and Normann 2000) and on barriers to welfare to work (Hall 2001). Considerable effort was made in both cases to secure participation from those directly affected, and that contributed significantly to the results achieved. It helped create networks that could not have been built up through other means—though the scale of effort needed means this approach is not a panacea for using the internet to generate responses to consultations.

Handling email presents similar problems. Many elected representatives are fearful or unclear about how to handle the volume of traffic that can be generated. The US House of Representatives received 7 million emails in December 2000, and individual Senator's offices can receive 55,000 emails a month (Congressional Online Project 2001). A major contribution to this has come from advocacy groups and grassroots activists who have encouraged mass-emailing of Members of Congress. It must be doubtful how far such groups will voluntarily exercise self-restraint, and systems involving filtering and automated responses are likely to be necessary. But as the Congressional Online Project study reports, relatively few Congressional offices use the available software that can handle such volumes effectively.

The volume of email traffic to UK Members of Parliament is far lower, but similar issues arise. The Hansard Society is helping develop suitable filtering software and is also investigating systems whereby constituents could be identified by digital signatures, so that their email can be quickly picked out and dealt with.

These initiatives are vital if the full benefits of the internet to the democratic process are to be realised. At present citizens can be much better informed through online access to information, but lack effective new channels to put across their views and reactions. That is an unbalanced position, and more research is needed into developing ways in which governments and politicians can get informative feedback.



## **COUNTERING ILLEGAL OR UNDESIRABLE ACTIVITY THE INTERNET**

The internet has its dark side—one that gets ample publicity. The ease of communication and the opportunity for anonymity provide many benefits, but they also offer opportunities for a range of illegal or undesirable activities. Well-publicised examples include distribution of child pornography, unregulated gambling sites, communication of terrorist information, and financial scams such as share-ramping.

Governments are grappling with how best to deal with these issues, both through domestic legislation and through international co-operation. But in doing this, they need to maintain a coherent strategy, and particularly a coherent presentation. Otherwise, there is a risk that action in these areas will overshadow more general campaigns to promote internet use, or will be seen as inconsistent with those campaigns.

Some examples serve to illustrate the problems that can arise: the UK Government's legislation on email interception; and the Australian Government's legislation on online content and on interactive gambling.

## **INTERCEPTION OF COMMUNICATIONS**

The usefulness of email as a means of communication is just as relevant to criminal activities as it is to legitimate business. That has led to Governments seeking powers and means to intercept emails on a similar basis to phone conversations, faxes or letters. At the same time, the increasing availability of encryption services has led to a perceived need for new powers to enable the relevant authorities to decrypt seized or intercepted material.

Interception of communications has long been a sensitive issue, raising concerns about threats to civil liberties. It has been hard for Governments to pick their way through the various competing interests, especially when the underlying technologies can change rapidly. The opposition to the US Government's "Clipper Chip" proposal, first unveiled in 1993, provided an early example.

In February 2000, the UK introduced its Regulation Of Investigatory Powers Bill. This contained provisions which required ISPs to set up facilities to enable emails to be intercepted once a warrant had been issued, and required the surrender of decryption keys in certain circumstances (Home Office 2000). Earlier proposals involving the use of key escrow systems had been dropped.

Because of the difficulties of dealing with future technological changes, the provisions in the Bill were cast in fairly general terms, with much of the detail to be included in subsequent statutory codes of conduct. This lack of detail in itself caused concerns, with objectors pointing to a variety of draconian actions that they argued would in theory be permitted under the Bill—going to jail because someone had innocently forgotten a decryption key was one example. There were suggestions that some inward investors would be put off coming to the UK because of the provisions—though no evidence of this happening in practice.

What started as a fairly low-key objections rapidly grew in intensity. The Government had to put in much effort to allay the concerns, and some provisions in the Bill were amended. The debate on this often overshadowed action that was being taken on other parts of the Government's e-commerce and e-government's agenda. It revealed the need for more to be done in advance to identify the likely points of difficulty and to present the counter-arguments more clearly if such measures are not to damage the Government's stance on its wider internet agenda.

## ONLINE CONTENT AND INTERACTIVE GAMBLING

The way the Internet spans national borders presents particular problems in dealing with illegal or objectionable content. What may be illegal in one country may be legal in another; and countries where material is legal have little interest in helping to prevent access via the internet from countries with more restrictive regimes.

Some material—such as child pornography—is illegal in almost all countries. In such cases, Governments and law-enforcement agencies have co-operated to track down offenders, and have had some successes in prosecuting those involved.

For other types of online content, Governments have reacted in different ways. The UK, for example, has not sought to bring in new legislation to update its obscenity laws. It has relied on industry self-regulation via the Internet Watch Foundation to deal with complaints about objectionable content, with existing legislation as a potential back-stop.

Australia, by contrast, passed the Broadcasting Services Amendment (Online Services) Act 1999 with the specific objective of extending the existing classification system for film and television to the internet. This makes certain content “prohibited” in Australia, whether it is hosted in Australia or overseas. During the passage of the Bill, considerable concern was expressed both about the potential impact on Internet Service Providers in Australia in fully meeting the requirements of the Act, and about the likely ineffectiveness of the legislation in stopping all “prohibited” material being accessed from Australia. This debate attracted public attention not just in Australia but overseas, portraying the Australian Government as attempting to ‘censor the internet’. In practice, the legislation has been implemented largely based on industry codes of conduct, overseen by the Australian Broadcasting Authority.

Online gambling is another issue causing problems for Governments around the world. Once again, different Governments have taken very different attitudes. The US Government has taken the view that “there is a strong law enforcement priority to prohibit Internet gambling” (Department of Justice 2000)—though States such as Nevada take a different view. By contrast, a recent Government-commissioned report in the UK said “We are clear that it would not be right to try to ban on-line gambling in the UK, and it would not, in any case, be feasible to do that.” (Gambling Review 2001).

In Australia, the focus has been on problem gambling, particularly following the Productivity Commission’s report. That led the Government to introduce legislation (the Interactive Gambling Act 2001) to stop Australian operators offering online gambling services to Australian citizens. It does not directly restrict Australian citizens accessing offshore sites, but prevents such sites advertising in Australia.

As with the legislation on content regulation, this legislation attracted considerable publicity within Australia. There was opposition, for example, to the inclusion of sports betting within its scope—based both on industry arguments and on the illogicality of allowing bets to place over the phone but not over the internet—and the legislation was subsequently amended to exclude most wagering on sporting events. There were also questions whether the legislation would be effective in its objective of reducing problem gambling, and whether it was potentially cutting Australia off from new business opportunities.

There may have been sound political reasons for the Australian Government to take a tough stance on online content regulation and online gambling. But as with the UK example, the debate tended to overshadow what the Government was doing in other areas to promote the use of the internet, and led to criticism that the Government was losing focus on its e-commerce agenda.

One of the problems for governments is that their action in these areas is often seen as more newsworthy than—for example—promoting internet use in schools. This is compounded by the weight of media coverage given to other activities on the dark side of the internet—to hacking and credit card fraud in particular. The cumulative effect of this concentration on potential problems with the internet can serve to put people off from getting online or making purchases online.

Governments need to take account of this, both in planning their own communications strategy, and also in deciding on policy priorities. It is unrealistic to expect that the e-commerce and e-government agendas should always take priority over policy proposals in other fields. But it is important that the potential pitfalls are brought out, and that a coherent strategy is developed for handling the problems that may arise.

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# Wireless emails: Issues, Challenges and Guidelines for Implementation

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## ABSTRACT

*Email represents just one of the many channels through which one person can convey information to another, within or among organizations. The advent of wireless technology has enabled emails to be accessed via a network or remote access has transformed email into a mobile tool. These wireless emails, equipped with devices such as wireless phones and personal digital assistants (PDA) are competing for wireless data access. However, the unexpected growth in recent months in using these wireless emails has opened up a gamut of management problems. This paper discusses two specific issues relating to wireless emails that effect both organizations and end users, namely, data integration at organization level and ad hoc collaboration among mobile workers along with the technical guidelines needed for an organization to changeover to wireless emails.*

*Keywords: e-Commerce, wireless emails*

## INTRODUCTION

Today's wireless emails are still in their infant stages (Smith & Andrews, 2001). These emails enable users to access organization emails in a non-connected mode. When such connections are established, security, access and privacy of data become important issues. A number of solutions have emerged in recent months to provide mobile email services in a secured manner for organizations. These solutions use some form of wireless technology such as Bluetooth protocol, a wireless application protocol used by Ericsson. Gartner Research predicts that by 2004, about 65% of Fortune 2000 companies will be offering wireless emails and personal information managers to their mobile employees. IS organization managers will need to deal with an ever-increasing amount of traffic to meet this demand to support numerous operating systems, devices and users that are not physically located in the office, and to address security issues and other management issues associated with this traffic (Schiller, 2000). These issues will become prominent very soon because the mobile user's first requirement is predicted to be access to emails, calendaring and contacts. If organizations ignore these mobile user's data needs, they will force these users to move to unsecured and unauthorised methods of remotely accessing emails, such as redirecting to a public website or through PC based software. This could, in turn, place the entire organization at risk, as corporate email will sit vulnerably on a public server, which can be accessed by unauthorised users. Therefore, while the IS managers have a responsibility to provide high quality service to their users, they also have the responsibility to protect corporate networks and data from any unauthorised use. The implementation of these responsibilities in a wireless context throws open issues and challenges that have not yet been encountered so far by IS managers. This paper highlights two specific issues in the wireless email usage, namely data integration at organization level and ad hoc collaboration among mobile workers. The discussion is followed by implementation guidelines for IS managers who are not familiar with wireless email technologies.

## DATA INTEGRATION

Data integration refers to the collection of data in an organization either at one point or at several points (Arena, 2000). Usually raw data is captured using forms, telephone interviews or by other mechanisms and then transformed into a form suitable to an organization's needs. Traditional emails are used as a tool to collect data such as a user's profile. Although information is submitted in an email message, all too often it is re-transcribed for one of the back-end systems. When such transcription takes place, valuable information is often lost due to typographic errors and lack of other verification systems. In many cases, organizations do not capture data when the business transaction is not fully realised. For example, a customer company inquires about a product and asks to buy 10,000 units of a product by a certain date. The selling company is unable to meet the requirements of the customer and does not win the bid. The selling company usually does not capture the customer details from the email, such as which products the customer was interested in. If this information was captured in the customer database, then this would allow it to be leveraged into future business. This leads to incomplete data integration in an organization because when this product line is re-evaluated there is no means of cross-referencing the information with customer needs. Further, the lack of data integration introduces a barrier when analysing the reasons for the loss of the bid – whether caused by timing, product quality or product availability? Therefore, data integration is an essential ingredient for an organization's success.

One of the reasons cited for such problems is the high cost involved in transcribing data and verifying the accuracy of the data once it is transcribed (Shroeder, 1999). Further, there is a time lag between the original data and transcribed data and businesses may not be able to afford such time delay.

While wireless emails provide a "good enough" technology layer that has some significant advantages such as accessibility, reliability of addressing and minimum effort in setting up, real economies can be realized when the information is collected on location, as a series of fields of information, and transmitted electronically to the home office, where it was directly inserted into a database. This process is one-step better than that of capturing information using traditional emails and then transcribing them into appropriate databases (Young, 2000). When using wireless emails, re-transcription of the information can be eliminated and the time taken to process data can also be significantly shortened. However, from an organization's point of view, emails need to be identified properly in order to integrate data to relevant databases. Further, for monitoring purposes, the originator and other signatory elements involved in the email need to be identified for security and authentication purposes. In addition, data transmission security issues become a major concern to organizations. This concern can be addressed by using Email response management systems (ERMS) to sort messages, allocate them to automated processing or human review as required, and track the turnaround time to ensure quality answers and timely response to the customer. However there are other challenges to be met and these are discussed later.

## AD HOC COLLABORATION

Mobile email is an ad hoc communications tool. These ad hoc networks are formed for specific purposes and once the purpose is no longer required, they are easily abolished and the communication channel discontinued. Using the wireless technology, it is possible to form ad hoc networks quickly. Wireless application protocols claim that these ad hoc networks can be formed in a secure and reliable manner. With voice and data a definite reality in the wireless domain, such ad hoc communication will soon be realised using wireless email (Smith & Andrews, 2001). While tools to facilitate these ad hoc communication channels are not commonly available to date, a number of vendors are building on the ubiquity of e-mail to create ad hoc collaboration tools that use generic e-mail — independent of vendor platform. Examples of vendors include Abridge, Intraspect and Quickplace. These tools allow the easy creation of working groups composed of people who may not all work for the same division or organization, or who may not even be in the same country. E-mail is the common denominator that links them all. Such grouping is of extreme importance in service sectors.

However, not all email applications improve ad hoc data integration. For example, IMAP, a fetching protocol allows the user to keep and organize files on the server. It enables only a shared folder. While the shared folder is one of the ways in which communication can be established, such communication is very restricted. IMAP by itself does not provide any other collaboration tools. In wireless email, if such collaboration is not fully endorsed, then these communication channels do not provide the full capabilities of communication (Lovell, 2000). There are, however, other ways to leverage simple generic wireless emails to perform a rich level of collaboration, but this is beyond the scope of this discussion.

A number of users have questioned the reliability of SMTP, message-oriented middleware. The strength of SMTP messaging is its ubiquity because its ease of implementation and use are contributing factors to its ubiquity. Building more capabilities directly into the protocol (with requirements for more-sophisticated implementation everywhere) is probably not advisable; building more reliability into a particular service is more desirable. In the 'last mile', an organization is at the mercy of the destination system which it cannot always control as it doesn't own the destination system's budget. Depending on how much of the path an organization can control (and how much it is willing to pay for it), it can either improve the service, or layer on top of e-mail some tracking numbers, receipts, encryption or check sums to provide assurance of delivery, non-tampering and authentication of the recipient. Without the 'last mile' it may be difficult to establish reliable collaboration.

## **THE CHALLENGES**

Both data integration and ad hoc collaboration brings in new challenges to both organisations and end users (Evans, 2000). In addition, service providers who provide a number of services to facilitate access and communication also face new challenges when it comes to wireless emails. Three specific challenges are as follows:

For the organization, wireless e-mail moves further away from corporate control — threatening to undo the effort and expense of the past five years in standardizing e-mail, ensuring reliability and reducing cost of ownership. For service providers, the fragmentation of messaging technology, delivering multiple e-mail, voice mail and instant messaging services, becomes even more apparent. These service providers would like to know how does a user process a single stream of communication when working with multiple services and multiple devices? For individuals, many of whom already find the volume of e-mail a major problem in work scheduling, a new source of peremptory interruption will arrive.

## **THE ORGANIZATION CHALLENGE**

Providing e-mail to wireless devices is more complex and demanding than providing it to desktops. Organizations must move toward a service provider model as the demands of e-mail services become more diverse. The challenges that threaten to drain the organization of time and resources are:

The increased complexity of multipart communication chains.

The diversity of ever-changing devices.

The need to accommodate not only e-mail access, but also access to other applications.

These challenges will cause many organizations to consider using external services providers (Arena, 2000). Even where organizations continue to operate internal services, the approach will shift from a standardized package of pre-configured services delivered to each employee, to a "cafeteria service" where options and service levels are defined. This will enable employees to select options and service best suited to their particular needs. This will also enable organizations to provide varying services to departments based on their needs. This has an influence on the organization's cost and impacts practical and cultural shift.

### **The Service Provider Challenge**

Users are looking for communication services but very often what they are offered is a jumble of service plans for different capabilities, on different devices, with inconsistent coverage. At the most basic level, few communications providers can even offer unified billing or customer service arrangements for wireless and fixed-line voice services. Moreover, inside the organizations there is rarely any coordination between those responsible for providing voice services and data services. Unified messaging remains for the most part a discussion only and not implemented fully. Each locus of control might attempt to offer "unification" of various message media, but they often miss the mark. For the user, it is important to unify messages between services, even for a single medium, rather than all message types coming into one destination because unification will facilitate to organize messages based on specified criteria.

The fundamental problem is that messaging technology enables organizations to deliver messages to addresses, not to people (Green, 2000). Once mobility is introduced, the inadequacy of this approach becomes apparent because users with different addresses will not be able to link services. This will force users to access different services using different devices. Responses are slowly emerging, reflected in vendor realignments such as the merger of Phone.com and Software.com to create OpenWave, and in a few innovative services such as Linx, I-Link, AccessLine and Call Sciences. However, due to the infant stages of the wireless and associated technologies, it may take some time before vendors providing provisions for integrating various services in order for users to access them using one access. For instance, in Australia, Telstra, the national telephone carrier, offers one billing service for mobile phones, the Internet access, mobile phones and other fax services.

### **The End User Challenge**

Once users gain some control over fragmented channels, another problem becomes apparent: there is no management of messages delivered to multiple devices. Most messaging software assumes that there is one message origination point and one end point, and that a user is equivalent to a single device (Evans, 2000). When using multiple devices, there may be multiple copies of each message, some perhaps transcoded to accommodate different device capabilities. If one message is deleted, what happens to others? Is a reply from one place visible from other devices? These are difficult issues that software vendors are just beginning to address and that service providers have not even considered. If these difficulties were not resolved quickly, this would result in wireless e-mail adding substantially to the burden of message management; in a significant number of cases and hence the rejection of the wireless opportunity.

Wireless e-mail is about to hit the "Peak of Inflated Expectations" on the Gartner Hype Cycle. However, it is likely that once it falls into the "Trough of Disillusionment" within the next year, it may take two or three years before it hits the "Slope of Enlightenment" and finally reaches the "Plateau of Productivity." However, there is value to be had now from wireless e-mail. Organizations and service providers need to give more consideration to end-user needs.



## WHAT TO DO: MOBILE MESSAGING BEST PRACTICES

Best practices guidelines for e-mail or any implementation include (Shroeder, 1999):

### Recognizing a problem

Recognizing that there is a need is the first step. A lot of technology is invented before a need actually exists, but technology works best when it provides a service or makes a product faster, cheaper or easier to use. The same concept works here. Are users requesting access to e-mail when they are out of the office during work hours? Which users fit this description best? As e-mail increasingly becomes a main communications method in the workplace, more users will demand "anytime, anywhere" access. Wireless is the only technology that fits this description.

### Assessing needs and solutions

Assessment is twofold. First, organizations must understand what type of devices are preferred, what is the travel and coverage needed, and how much usage is expected. Wireless e-mail incorporates three main components: the terminal (phone, notebook, pager or PDA), the network (cellular/PCS, CDPD or dedicated data) and the application itself. By performing a self-assessment, an organization will have a better understanding of its general needs and potential service rollout costs. Evaluating what applications, networks and terminal suppliers fit those needs is also important. One device or network does not suit all, so choosing a solutions provider (one that packages hardware, software and services for easy implementation) or putting the pieces together in-house will be easier when the organization's initial assessment of needs is completed.

### Implementing a solution

Implementing the service should be the easiest part. Most applications for wireless e-mail reside on a server and directly integrate with both Outlook and Lotus Notes (most e-mail applications target Notes or Exchange). Most solutions are shrink-wrapped and designed to work out of the box with little customization. Implementation also includes providing terminals and training for users, as well as adopting network services. Testing the wireless service for coverage is essential, as some of today's wireless e-mail solutions do not reach all users because of wavelength problems. So if signals don't adequately reach where the majority of users live, work and play, the service can't be effectively used. Multiple networks may be needed and are common, especially when the organization is supporting multiple devices across a large number of geographically dispersed users.

### Administrating the application

Administration should deal mainly with the day-to-day issues, such as security for those forgetting mobile passwords, working with network service providers, and supporting mobile devices and their peculiar behaviour. Requests for IT support can increase by as much as 25 percent during large-scale projects, especially at the beginning.

### Evaluating the results

Evaluation is the last step — but an ongoing one — in supporting wireless e-mail. Organizations should ask themselves the following questions:

Which devices do users prefer?

What's new on the market?

What are the main issues/problems that users have?

What are the usage amounts, and are they increasing, decreasing or staying level?

What coverage is needed, and is that changing?

Are there any revenue increases or cost decreases that can be associated with this application?

## BEST PRACTICES – WIRELESS EMAILS

Organizations should consider the following before implementing wireless e-mail (Lovell, 2000; Stowe, 2000). Gartner Research Group also provides guidelines along the following lines:

Leave device preference to the user as some may choose phones, others PDAs, depending on their style of work. In the end, an organization may need to support more than one device, depending on preference and network service available. This should last only until 2004, when devices become less tied to local applications for sending and receiving data.

Adopt a solution that isn't restricted to a proprietary device, network or server. Don't try to manage multiple e-mail systems internally, but develop a centralized one that supports both wired and wireless architectures. Roll out a pilot program first, making sure security issues and user expectations are worked out before distributing email access organization wide.

Decide on the level of security needed as some networks offer end-to-end encryption, while others go through third-party gateways or are converted, and thus may be less secure.

Use filters to help with the e-mail load as sometimes even simple delineating between read and unread messages can save time and money; prioritisation rules also can be used.

Training is important, but those experienced in e-mail should have no trouble picking up the wireless element, so keep it short and don't plan too much.

Expect help desk calls to increase, especially as the service is rolled out. Common complaints are security lock-outs or issues related more to the wireless service (e.g., delays and holes in coverage) than organization issues.

Limit the number of mailboxes per user. Supporting e-mail from multiple sources is complicated enough.

Enforce the use of a one e-mail box solution, and look into unified messaging systems, if necessary.

## CONCLUSION

While the potential of wireless emails is not fully realised, the indications are that by 2005, vendor applications will appear in the market making wireless emails a common feature of communication. However, the management of messages and hardware devices is identified as a problem in the area of wireless emails. This problem provides initial doubts in the area of ad hoc collaboration, which is claimed as one of the major strengths of wireless applications. When there is an impediment to this ad hoc collaboration, an organization may find it difficult to realise the concepts of data integration. Without proper data integration using wireless emails, achieving success becomes a problem. Therefore, organizations should take necessary steps to ensure that data is properly integrated and ad hoc collaboration is appropriately facilitated to realise benefits.

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# STRATEGY OR STRATEGIC TOOL? : THE ROLE OF INFORMATION SYSTEMS IN CHANGE MANAGEMENT

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## ABSTRACT

*The paper presents a preliminary framework for making sense of, and managing change, in organisations which have adopted information systems (IS) and e commerce as a core element of their business strategy. It is argued that the relatively low level of organisational benefits realised by typical strategic information technology interventions over the past decade, is often a product of poor adoption and implementation practices on the part of senior managers and IS practitioners— who have failed to understand the non-linear nature of change in complex organisations. (Thorpe 1998); Sauer (1997); Fitzpatrick and Terzioviski (1999). This paper argues that a clear understanding of: the dynamics of change( at the people/technology interface), and the symbiotic relationship between information systems and strategy— is a prerequisite for the successful business benefits realisation for major IS and e commerce projects. Gardner and Ash(2001).*

*Lessons learnt are distilled into a basic model to provide senior managers and IS practitioners with a clearer understanding of the conditions for successful adoption and implementation of information and communication systems (ICS) approaches to change management within complex and dynamic organisational networks.*

## INTRODUCTION: CHANGE MANAGEMENT FAILURE IN THE 1990S.

The 1990's witnessed the failure of many planned change interventions to achieve their original objectives or realise significant 'hard' or 'soft' business benefits for host organisations in Australia, the US and the UK. Stace and Dunphy (1995); Burnes (1996); Carloppio(1998); Wilkinson et al (1998); Zbaracki(1998); Fitzpatrick and Terzioviski(1999).

Information systems focused interventions such as: Business Process Re-engineering (BPR) and Enterprise Resource Planning (ERP) feature prominently in this catalogue of costly change failures, with reported levels of satisfaction with strategic IS investments amongst surveyed senior executives in US corporations (1989 -1997) ranging from 20-75%. Holland and Kumar (1995); Sauer (1997); Thorpe (1998). Ironically many respondents were senior managers who sanctioned investment in strategic information systems which they '*wanted to be seen to engage with*', but neither '*trusted or understood*' — contributing to an estimated US\$145 billion in write offs for US corporate IT investments in the mid- 1990s. (King 1997, cited in Thorpe 1998:12). McHugh (2000) cites several more recent examples of '*Faustian*' IS contracts signed by big corporate clients buying into Enterprise Resource Planning(ERP), claiming that 37 out of 100 US executives responsible for ERP adoptions between 1996 and 1999 could not identify any positive impact of these systems for their businesses.

Whilst IS writers including: Thorpe (1998) Thorpe and Koh, Soh and Markus (2000), suggest that these failure rates will decline with systems advancements, maturation in project management and improved benefits

realisation models, the continuing impact of IS based change failure on corporate profitability and effective organisational functioning in all sectors, continues to warrant closer investigation.

## RESEARCH OBJECTIVES AND METHODOLOGY

A comprehensive investigation of the factors that determine IS based change failure or success is beyond the scope of this paper which aims to: *“inform future practice in the field of change management by investigating the symbiotic relationship between strategy and 5<sup>th</sup> generation information and communication (ICS) systems within complex organisational environments.”* More specifically *‘the role of information systems within the broader change management equation will be explored.’*

The investigation and subsequent analysis was undertaken with reference to:

(1)- Recent literature on strategic approaches to change management and strategic information systems to highlight key concepts and current applications, successes and failures in these fields; (2)- Data from interviews with four experienced IS consultants and two senior IS project managers, to provide insight into the limitations of current IS based change consulting practices; and (3)- Two recent case examples: A provincial bank which combined BPR and e Commerce technologies as part of a successful strategy to capture a significant share of the on-line housing loans market in the UK market between 1995 and 1998; and an offshore engineering company which used Web front- end technology and ERP to make significant efficiency gains for minimising offshore personnel costs and optimise use of the available labour pool.

These case examples of (ICS) technology as a platform for change will be discussed in section 5 following a consideration of some of the typical problems and issues associated with information technology projects in section 4. Section 3 below briefly examines the defining characteristics of strategic change management and offers a brief discussion of the role of information technology within the broader strategic blend or change equation.

## STRATEGIC APPROACHES TO CHANGE MANAGEMENT

The notion of implementing planned reforms to reorder the human and technological dimensions of the organisation has been in existence since the conception of the earliest armies and bureaucracies pre-dating Christian times. Postman (1992).

In recent times the idea of planned interventions to bring about changes in individual behaviours, team and organisational performance was popularised by Kurt Lewin, Rensis Likert and other U.S. based key figures in the Organisational Development movement of the 1950s – 1970s. During the same era Europe and Scandinavia witnessed the emergence and growth of the Socio-Technical movement which made a significant contribution to current systems thinking and the nature of interactions between people and technology. Waddell, Cummings and Worley (2000).

Although the popularity of OD and Socio-Technical schools of thought declined in the 1980s many of their fundamental principles and methods have been carried forward into current change management consulting practices. Stace and Dunphy (1994).

In the 1980s and 1990s the dominant approaches to planned change were premised on the idea that: 'Structures, processes, technology and human skills, capabilities and knowledge can be reconfigured to support or optimise the achievement of identified strategic goals'. These included Total Quality Management (TQM); Business Process Re-engineering (BPR) and various forms of IS interventions including ERP and e Commerce systems. Burness (1996); Wilkinson et al (1998); Stace and Dunphy (2001).

As discussed in section one of this paper planned change in its various forms had a fairly poor track record throughout the 1990s, with TQM, BPR and IS failures incurring massive financial (and arguably human resource) costs with limited returns to the client organisation. Whilst the reasons for these failures are manifold it is proposed that senior management's view of strategy, as a linear process, implemented through conventional project management models, over predictable timeframes, was a major contributing factor. This mechanistic view of strategic change, which ignores the emergent, processual, and relationship-based models advanced by prominent theorists in the field of strategy and change management including: Quinn (1980); Pettigrew and Whipp (1991); Mintzberg and Quinn (1991) and Stacey (2000), is particularly evident in major IS project implementations. These were characterised by a deterministic 'strategy in a box' approach, where people are configured around systems to ensure optimal organisational performance. Taken to its logical extreme model, capable of adapting to the changing conditions at the hub of a complex, Web-enabled 'intra' and 'inter-organisational' network.

To advance our understanding of change within complex IS or Web enabled organisations, the paper will briefly explore some of the factors that precipitate the success or failure of technology- focused interventions. In the final section a model is presented which attempts to explain the complex interaction between strategy, technology and people within this type of networked organisation and the symbiotic relationship between strategy and information systems. (See figure 1, section 6).

A brief resume of factors contributing to previous IS based change failures and successes will be explored with reference to interview data and case material, in sections 4 and 5 below.

## INTERVIEW FINDINGS: IS PROJECT FAILURES

Interviews conducted with four IS consultants and two senior IS project directors between October 2000 and February 2001 revealed a number of issues which were identified as contributing to project failure. These are described below under three main headings- '*Client issues*,' '*Vendor issues*,' and '*Consultant Issues*':

### Client issues

Senior management (client) ignorance of IS applications and their potential ramifications throughout the adoptive organisation, was identified a prime contributor to project failure. Two respondents noted that several clients they had dealt with had adopted high cost (typically US\$ 5m plus) ERP technologies as a silver bullet solution to fix Y2K and other legacy system problems. Clients were criticised for their lack of up-front consultation with their own senior IS specialists, acceptance of unrealistic budgets and deadlines from consultants and failure to establish a clear business case for systems adoption. According to Thorpe (1998) these types of adoption practices are reflect linear industrial age thinking, based on the assumption that plugging in extra technological capacity, will necessarily generate business efficiencies and more profit.

## Vendor issues

Vendor indifference to the specific human, operational, and business requirements of client organisations was identified as a major contributor to project failure or low levels of benefits realisation. Vendors were seen to be primarily concerned with selling template solutions on set margins which could be rolled out across a clearly defined timeframe. This problem was compounded by the high costs associated with product customisation, switching to an alternative vendor if dissatisfied, and the general disruption to workflow and productivity caused by system installation disruptions. Each of these factors contributed to low returns for the organisation on the original IS investment.

## Consultant issues

Not surprisingly many of the consultant and vendor issues were similar, given that some consultants worked for the vendor, whilst others worked closely with the vendor (on behalf of the client). From the perspective of the two project managers interviewed the biggest problem for them was the increasing tendency for consultancies to hire 'technicians' trained to follow standardised methodologies, rather than strategists who understood the organisation's business model, and were capable of implementing change across the people/technology interface.

## CASE STUDY INSIGHTS

### Case 1: Bank .com

The case of a highly conservative, provincial UK bank that used BPR and Web based technologies to become a major player in the UK internet home loans market is a remarkable illustration of both effective management and subsequent mismanagement of the technology/strategy relationship.

In the early 1990s the conservative lending policies and traditional branch banking structure that had served the bank well in their traditional provincial markets during the 1980s looked like becoming an increasing liability with the entry of major UK and European players. The prospect of steady erosion of their core customer base by institutions with immense capital bases, superior technology and international networks and the increasing danger of a forced merger or takeovers, moved the banks conservative to board initiate a survival strategy. This required a massive departure from their existing approach to lending through detailed personal vetting of customers and an extended approvals process, which passed through seven layers of hierarchy for loans over 100,000 pounds.

In 1995 the board were persuaded that early entry into the new '*technophile*', 18-35 year old, internet-based banking market— represented their only significant opportunity for expansion into the broader UK market. At the same time they sought to recoup significant business benefits from the new Internet technologies within a two-year period from 1996-1998, whilst maintaining their '*no forced redundancy*' policy.

Despite the considerable challenge involved in achieving these apparently conflicting objectives, both outcomes were achieved. The first through an innovative staff redeployment strategy, which transferred branch employees into a massive centralised call centre servicing the entire UK market for internet sourced housing loans. The second through a change strategy combining BPR, value chain analysis, cost cutting, and an aggressive Web based business to customer (B to C) marketing strategy.

Under the new business model three distinct businesses were identified under a holding company structure: The traditional 'Retail' branch banking network; 'Commercial' banking; and 'Bank.com', the bank was able to offer a combination of traditional and electronic banking services. These covered 'UK based', 'Offshore', and 'International' customers, with low cost, credit scored, housing loans supplied on-line through the call centre and broker network, which recorded a turnover of over 250m pounds in 1999.

As an IS based change initiative, the re-engineering of the original bank structure, processes, and information technology base to create Bank.com and two other streamlined business units, proved to be a great success.

The BPR intervention saved the business estimated at 30.1 million pounds per annum, and combined with the value analysis methodology reduced the cost of processing a housing loan by over 50%. The bank's Internet based business grew at 25% per annum between 1996 and 1999. In 1999 bank estimated that the return from their investment in consulting and information technology adoption since 1995 was in the order of ten to one.

Since that time the bank has continued to record a steady increase in profitability due more to the rapid growth in the UK housing loans and financial markets during 2000, than effective strategic and business management. However major changes in the bank's top team in 1999 and 2000 combined with increased exposure to high risk commercial loans, led to increasing concerns being voiced by shareholders and analysts in the UK business media. \*1 These concerns were compounded by the departure from the 1995-1998 business model through the use of Customer Relationship Management(CRM) technologies, in an attempt to integrate three successful stand alone business units. Paradoxically the board's recent decision to roll back the implementation of their CRM project, which is currently 100m over budget, reversed many of the gains from the investment in BPR and Internet technologies, as tools with a clearly defined role within a well conceived business model. \*2

## Case 2: Engineer.com

Engineer.com is the Norwegian-based operation of a large US multinational and a global leader in energy services, equipment, engineering and construction. Until recently one of the major challenges facing the company was the high cost of employee resourcing for its offshore oil and gas operations, particularly with regards to scheduling, shift arrangements, and the associated logistics for skilled offshore workers.

In order to minimise these costs through optimal work scheduling and shift patterns the management realised that they needed remote access to relevant HR data such as shift details and updates on local employment regulations. (There are significant penalties in Norway for companies which employ foreign workers over an agreed time quota).

Although the need to drastically reduce personnel deployment costs was apparent to the offshore project managers, the bureaucratic and autocratic culture of the organisation had previously prevented a creative solution emerging from management or other key players in the organisation. Early in 1999 the situation changed when the HR manager and project team championed the idea of a personnel management intranet to leverage the power of graphics and internet technology and extend the reach of the existing ERP system to remote users seeking real time access to crucial deployment and scheduling data. Following an intensive six month period spent educating peers, project managers, and other potential system users on the benefits and applications of the technology and building a sound business case for senior management, the HR team were successful. The intranet project was adopted and fully operational within a year, with the significant addition of wireless application protocol (mobile) technology to enhance network accessibility.



Within six months of the new system being established and being accepted and understood by the project managers and other key stakeholders, significant cost savings of over US\$100k were recorded. The major benefits realised from the application of the new technology resulted from optimised shift patterns and increased flexibility in the deployment of staff and contract personnel, in response to delays, downtime and other offshore operational contingencies. Other related benefits identified by the researcher included: improved relationships between the companies onshore and offshore management staff and the local government agencies responsible for supplying and regulating the deployment of staff; improvements in IS end user skills; and better decision making by project managers resulting in reduced uncertainty surrounding work patterns and continuity amongst staff and contractors. Ash (2000).

## **MANAGING EMERGENT CHANGE?**

The bank and the engineering company cases both demonstrated the benefits of judicious use of IS and internet technologies as tools to support a business model with objectives shared and understood by all major project or program stakeholders including: Senior managers; IS specialists; business unit managers, HR managers, and other change agents responsible for the implementation, communication or facilitation of the broader change process. The need for shared understanding of the *'role of technology within the change management and strategy process'* has also been identified as a unifying theme, emerging from the literature review and field research sources explored in this paper. Beckford(1998); Remenyi(1999).

However future change management practitioners face a significant challenge in trying to deliver ambitious business outcomes for organisations operating in increasingly complex and dynamic network environments. New theories and models of change management are required to help practitioners understand the complex dynamics of change within organisational networks seeking to harness the power of 5<sup>th</sup> generation information and communication technologies. Figure 1. Below is offered, as an initial step towards building this understanding by serving as a common reference point for senior managers, IS practitioners and all internal change agents and key inter-organisational stakeholders such as major customers and suppliers.

S-T-R-A-T-E-G-I-C  
I-N-T-E-N-T

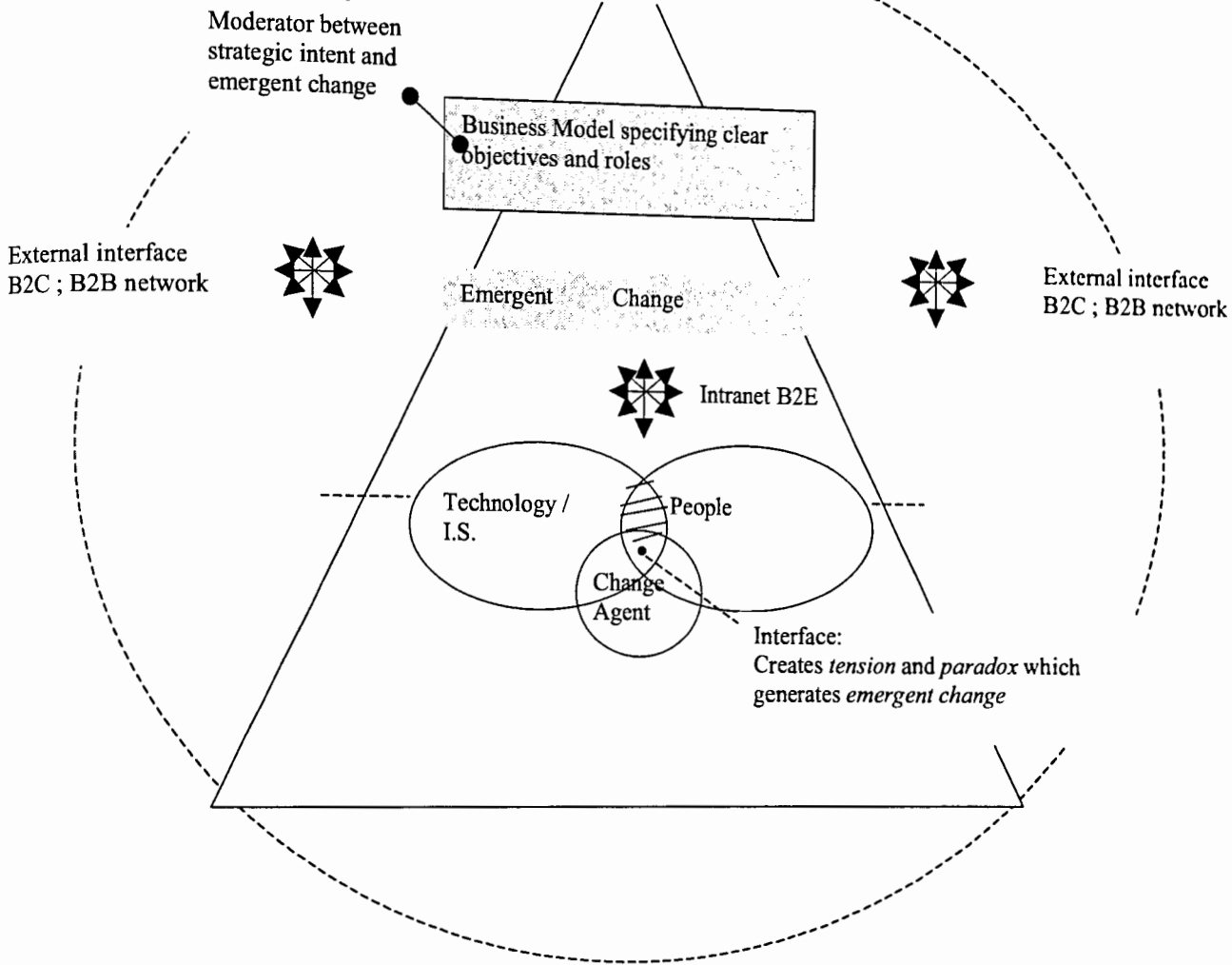


Figure 1: A symbiotic model of change in ICS-enabled networks

## CONCLUSION

Figure 1 illustrates how change in complex ICS-enabled organisations is generated at the interface between people/technology / and change agents. Whilst conventional change theories and methodologies suggest that change can be planned and systematically managed through a series of programs or interventions, the model suggests that this process is constrained in complex networked environments. It indicates that change can be managed up to a point, through shared stakeholder goals and careful interpretation, application and adjustment of change methodologies by IS practitioners and other parties involved with the implementation process. Beyond this the ongoing process of technology/people/change agent interaction generates tensions, paradoxes and unplanned changes that can have positive and negative consequences for the organisation.

This emergent change by definition is extremely hard to control and can only be managed through constant mutual adjustment between all the key players in the change scenario. To cope successfully with emergent change all major stakeholders must have a clear understanding of the business model, it's objectives, and the role of technology within the process. This requires acceptance of a new set of management practices suited to non linear and at times chaotic environments. These include: flexibility; effective interpretation of change contingencies as they arise with optimal use of decision support tools; and crucially — high levels of trust and ongoing dialogue amongst all stakeholders throughout the network. These principles aim to inform future theory building and models, which support the development of a post- industrial age understanding, of change management within complex networked organisations.

\*1 and 2: The details discussed are derived from an interview with a senior manager within the bank and press coverage from June 2001. Exact sources and the identity of the bank cannot be revealed at this stage for confidentiality reasons.

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# Universities Operating As E-businesses: - An Evaluation Tool for Selecting Computer Based Training Materials

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## ABSTRACT

*Universities worldwide increasingly are business oriented as they respond to environmental changes. This paper will briefly discuss these changes and the need to provide computer training for students and staff by offering online computer based training materials. Before purchase of these training packages, universities are best to evaluate them formally and so take into account the future direction of the university, needs of students and staff, and resources available. The paper discusses a proposed procedure developed at a major university in Australia, for evaluating online computer based training packages. The procedure is a combination of the results from two university's work and usability testing methodologies. The procedure proposed will be studied on a pilot basis to test the efficacy of the methodology, and the results to form the basis of the next stage of the work.*

*Keywords: electronic commerce, higher education, training, evaluation tool*

## INTRODUCTION

Western societies are moving from an industrial to a knowledge-based economy. One of the major impacts of this change is that universities are becoming business oriented as they respond to two major sources of environmental change – reduced government funding and the increasing ‘push’ to use computer technology in teaching and learning and the supporting administration systems. This paper will discuss the environmental changes for Australian universities and so the increasing need to provide computer training in a systematic and coordinated way for students and staff, by offering online computer based training materials. However, before purchase of these training packages, universities are best to evaluate them formally and so take into account the future direction of the university, needs of students and staff, and resources available. A procedure, developed at a major university in Australia for an evaluation of online computer based training packages, is proposed.

## THE CHANGING HIGHER EDUCATION ENVIRONMENT

The higher education environment in Australia has changed rapidly in the last few years. A combination of factors might be suggested as contributing to the change. These factors include: changes in the Australian federal government education policy; an economic rationalist approach to managing the economy; the effects of ‘globalisation’ and ‘internationalisation’; the introduction of computer and technology based instructional systems (particularly internet technology) into education; and what has been termed the third wave of global change: ‘knowledge production and management’ (Toffler 1998)(Zohar, 1997).

In a globalised economy the labour force has two things to offer, low wages or a well-educated and highly qualified manpower. Therefore in countries like Australia the development and growth of higher education as a "product" is critical. Australian universities have recognized this and so have started to move towards becoming international knowledge producing units and undertaking a larger role in society by participating in and contributing to the stimulation of the economy and its growth (Pellert, 1998). Furthermore Clark (1998) argues that global forces create another level of demand on universities who have to deal with factors such as fluctuating funding sources, changing policies of governments, and varying perceptions of universities as workplace trainers and places for the socially upwardly mobile. In addition, universities not only compete with other universities internationally but with knowledge producers in other segments of society.

In this changing environment, it is argued because universities have to achieve contradictory goals, such as universities have to do more with less money and they have to maintain a cultural heritage while meeting a high demand to develop new fields of study and thought, that an entrepreneurial response by universities offers a better chance to control their own destinies (Burton-Jones, 1999).

## **THE CHANGING LEARNING ENVIRONMENT**

Tsichritzis (1999) observes that it is tempting for universities to see the current economic climate and 'globalisation' as temporary, and so defend the existing structures and roles, and wait for better days. Nevertheless, Tsichritzis insists that there is an increasing need for an attitude of 'life-long learning' in relation to further education and professional development training to accommodate the changes in the work environment. Thus, universities – once designed for a captive market of somewhat elite cohorts of post-secondary school students – have to address the changing spectrum of student profiles (older-age students, international students and professionals). In addition, Twigg (1994) argues that physical or manual work and the notion of one career will gradually disappear. He states that forecasters envisage that in an average work life people will have several different careers, each requiring new skills, new attitudes and new values, and retraining will be constant because the 'technology' of each profession will be changing rapidly.

It is also predicted that those participating in learning and training will not always be able to attend classroom sessions, but will be best taught in the workplace – on the factory floor or in the office, out at sea, and in the home. Learning will not always take place with books, overhead projector or a whiteboard. Learners will use tools such computers and all the accompanying software applications and Internet communication technologies, cable television, video-conferencing and CDs to name a few.

The ensuing outcome means that academics will require skills in using computers in order to teach in new learning environments. Furthermore, because the student cohort has changed, academics will be teaching to students who have a range of learning needs because of their varied backgrounds, ages and stages. Thus, academics will need to go beyond the traditional classroom lecture and explore the range of computer based educational materials, to accommodate the different learning environments and learning arrangements (Twigg, 1994; Bastiaens, T.J., & Martens, R. L., 2000).

## **THE CHALLENGE**

The challenge then is: how do universities in the context of a dynamically changing global environment, who are increasingly needing to be entrepreneurial and business-like, and increasingly using computers in education and the accompanying automated administration systems, support their students and staff, to learn, work and live with computers?

It is suggested in response to this challenge, a systematic and coordinated training approach to support staff and students is taken (Mulholland & White, 2000). One of these approaches is the use of online computer based training materials, as it is accessible and easy to use (via an Intranet for example), it can support current training courses and can complement any computer training embedded in tertiary subjects. It also resolves many of the issues inherent in more traditional education paradigms. The most apparent is its ability to:

- distribute information both locally and globally
- provide flexibility, that is students and staff can study at their own pace and in their own time
- provide additional features such as electronic mail, bulletin boards, different types of media delivery and automated testing
- incorporate an administrative system for monitoring and tracking student progress.

Online computer-based training offers many advantages, however selecting a suitable product or package in the face of reduced training budgets and a myriad of companies and products is the next major hurdle. The following aims, assumptions and scope were put forward as guiding principles for a business case to develop a procedure to evaluate online training packages.

## **BUSINESS CASE – GUIDING PRINCIPLES**

### **Aims**

The aim of the procedure developed for evaluation of on-line computer based training packages was for its potential to enhance computer literacy and competency and its ability to deliver benefits to university students and staff, and so support the university's strategic directions.

### **Assumptions**

Evaluation of online computer based training to be based on the assumptions that it be:

- learner centred
- easy to use and accessible – on and off campus
- structured
- modularised
- project based
- is able to support 'just in time' learning
- maps onto an accreditation procedure, such as the International Computer Driving License (ICDL) or similar
- has either an administration overlay that is built in or is compatible with a package that can monitor and track: Usage
- Assessment results and learning
- complements the current face-to-face training
- meets budget goals
- provides an environment where learners can practice and rehearse new skills
- has training materials that are current with current/conventional software packages

Lastly, 'if it doesn't teach, it has no value'.

## Scope

Defining the extent of the procedure included exploring the different types of training courseware packages available. It was discovered that there are three main categories of technology-based training courseware: entertainment, subject matter and skills. Skills-based training courseware was chosen because it seemed the more appropriate for the aims of the evaluation, it combined content and technology, and provided content for a learner to practice the skill and so be able to apply it effectively (L'Allier, 2000).

The overseeing committee also agreed that the evaluation should focus on the following aspects:

- structure and appearance of the courseware
- usability test results from users (pilot)
- assessment of learning effectiveness and productivity
- cost effectiveness of the product.

## EVALUATION PROCEDURE

### Introduction

Evaluating software for learning and teaching has a history of using conventional approaches, such as checklists of varying descriptions. Squires and Preece (1999) argue that checklists are seriously flawed in principle because they do not encompass a consideration of learning issues. Further, checklists can be too simplistic and so evaluation questions and methodologies become inappropriate, there is also a lack of validity and of being too narrowly focused (Mulholland & White, 2000). In addition, the ability of checklists to predict educational issues in all but a naive and superficial way has been questioned by several researchers. On the other hand, attempts to apply more complex evaluation procedures are excessive and tedious to apply (Squires and Preece, 1999). Squires and Preece (1999), who are currently researching and developing a set of 'learning with software' heuristics, propose that there is a relationship between the Nielsen (2001) heuristic evaluation principles and a predictive evaluation tool that takes into account both usability and learning issues.

In this case the procedure that was proposed for this university attempts to combine the ideas and principles of both Mulholland and White, and Squires and Preece. Though, it is primarily based on a model designed by Mulholland and White (2000) from the University of South Australia. The model has three phases – planning, conducting, and reporting of results. The key feature is the emphasis on stakeholder involvement, so that all parties who have an investment in the outcome of the evaluation are included and involved in the process, from beginning to end, to ensure ownership and responsibility of the procedure. The model has three phases. The first phase is the planning aspect of the evaluation process and includes the establishment of goals, methodology of choice, scope definition, consultation with stakeholders, and documentation procedures. The second phase is the actual evaluation, and includes the application of the procedure and documentation. The third phase is reporting, and includes the methodology to minimize bias of results and maximize usability of results, the distribution of the actual report findings to all interested stakeholders and their input, and means of marketing and distributing the report across the organization.



For the purpose of this paper the actual evaluation procedure proposed for this university will be described and has six components:

administrative requirements  
technical quality  
usability testing of the online environment design  
expert evaluation of educational design and content  
user evaluation of educational materials  
long term surveys for computer training managers and academics

### ***1. Administration requirements***

The administration section was a form to be completed by the facilitator of the evaluation procedure. The aim of the form was to gather information about each of the companies and included questions such as:

is it compatible with current network capabilities?  
can it monitor usage by learners?  
is there marketing and publicity support available from the company?  
can it be made part of performance appraisal system?  
are there inbuilt privacy and security policies?  
is there a maintenance agreement?  
what access is there to support services?  
what is the retail price, and optional extras prices?  
what is the manufacturer's reputation?  
are there preview copies available for pilot testing?

### ***2. Technical quality***

The technical section was a form to be completed by a computer technician. The data gathered to form a technical baseline, and includes questions such as:

what are the platform and operating system requirements?  
does it have the ability to import / export information captured with other authorware and digitizing devices?  
is the program reliable in normal use?  
is the program 'bug free' and, 'crashproof' for the student user?  
what are the error messages - are they appropriate?  
does the program run without unduly delays (loading graphics, for example)?

### ***3. Usability testing of the online environment design***

Usability testing is an essential investigation into whether an application is performing the functions for which it is designed. Usability testing for an online application indicates if there are major or minor problems in the design and whether students and staff are able to use the materials. Tests can be conducted one-on-one or in small groups. The tests may take place in a formal lab or in a more typical environment like home or work. The usability testing methodology proposed was based on the work of Nielsen (2000, 2001) and Pearrow (2000) and consisted of a performance test of the software package to gather data via direct observation of how the package is used, 'verbal response', and post-test qualitative questionnaire.

#### ***4. Expert evaluation of educational design and content***

Expert evaluation from online educational authorities is to be sought within the university. A form was designed to assist gathering their feedback, and included questions such as:

- is the program well constructed and designed?
- are the screens clear and acceptable to users?
- is navigation easy?
- are instructions clear?
- can the user exit easily?
- does it include feedback as you learn/participate?
- is the program free of technical quirks and 'glitches'?
- is the information relevant and up to date?
- is the instructional design up to date?
- are the course objectives clear?
- do the activities in the courses give sufficient practice and feedback?

#### ***5. User Evaluation of educational materials***

A sample group of students was proposed to test the different training modules and rate them for ease of learning, time required to work through each module, and if they 'liked' the training packages or not.

### **METHODOLOGY**

The evaluation consisted of a performance test of the software package to gather data via direct usage of the package with 'verbal response', and a post-test questionnaire. The test to have four components, as detailed below:

#### **1. Participant greeting and background questionnaire**

Each participant to be greeted, offered a seat and a complimentary drink, consent gained and each asked to complete a background questionnaire. Participants advised that they would remain anonymous throughout the testing and subsequent reporting.

#### **2. Orientation**

The participants to be read a short orientation script by the test facilitator.

#### **3. Performance Test**

Participants undergo a performance test. Each course/module is introduced by way of a short scripted introduction by the facilitator, who also sets the computer at its starting point. Each course/module is worked through by the same participant for each company. An observer records comments, questions, difficulties encountered and time taken to complete each module. There to be five individual results for each course/module.

#### **4. Post-test Evaluation questionnaire**

On the completion of the test, participants to be asked to complete a post-test.

## 5. Suggested long term surveys

The various training applications would be evaluated (as described above) a package would then be selected and implemented. It is suggested that following this, ongoing surveys of training satisfaction be measured (of students and staff) via the inbuilt software administration system. The training application will also be evaluated by training managers and academics (who use the online training packages inside their subjects), on a regular basis. The following is a suggested list of questions for that purpose.

### A. Survey Questionnaire for IT Training Managers

do staff/students like online training?  
did staff/students acquire knowledge & skills?  
did staff/students apply new skills or knowledge on the job or in their studies?  
is it cost-effective and effective, as made out to be?  
could the same result be achieved more cheaply and/or differently?  
do staff/students enjoy this approach?  
do staff/students rate it as high quality?  
are staff/students motivated to learn more?  
is feedback built in, re the program and approach?  
does it engage the staff/students?  
does it encourage collaboration/learning environments?  
does it meet clear educational, life, and organisational strategic goals?  
did the application of online computer based training materials increase productivity in their work and/or studies:  
volume?  
speed?  
accuracy?  
quality?  
does it reduce the number of Help Desk calls?

### B. Survey Questionnaire for academics re Online Training

what do students need to improve their computer skills?  
would they recommend online computer based training materials?  
does online computer based training materials stimulate discussion, further learning?  
do they like using online computer based training materials and would use it again?  
can the learning be measured?

## CONCLUSION

Universities are increasingly operating as businesses, and use computer based administration and education systems to meet strategic and quality assurance goals, and teaching and learning objectives. As a result, ongoing computer-based skills' training is required to support students and staff to study and work in an online environment. Online training packages offer a comprehensive and systematic method for delivering training across single or multiple campuses. However, as they are expensive to implement and maintain, choosing a package to suit the individual needs of each university requires a framework to aid the decision-making process. The procedure proposed is a compilation of the results from two other universities and usability testing methodologies. The model proposed will be studied on a pilot basis to test the efficacy of the methodology, and the results to form the basis of the next stage of the work.

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# A Framework of Security Authentication for Internet Banking

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## ABSTRACT

*The advent of Internet Banking has shown the importance of effective method of authenticating a user in a remote environment. There are many different countenances to contemplate when examining Internet based security. One of the most tried and trusted techniques of protecting the safety of systems and data is to control people's access. The foundation for such measures is authentication. Specifically for Internet banking there is a real need for a way to uniquely identify and authenticate users without the possibility of their authenticity being cloned. This paper proposes a framework concerning how to identify security requirements for Internet Banking.*

*Keywords: E-Commerce, Computer Security, Internet Banking, Authentication.*

## INTRODUCTION

E-commerce fundamentally focuses on the electronic exchange of information using information and telecommunication infrastructures (particularly the World Wide Web and the Internet). E-commerce encompasses a wide range of commercial activities that can be categorised into business-to-consumers and business-to-business sectors. Industry sectors such banking have openly embraced E-commerce to improve their performance and gain a strategic competitive advantage. But many customers are wary to bank through their computer. Hardly a month goes by without the launch of an Internet bank. Some are new banks while others are the descendants of well-established banks. The new banks promise a lot. They are built on advanced and secure technology so customers can bank with total confidence and promise security consumers can trust and are concerned how safe is on-line banking?

However there have been numerous incidents that point to gaping security holes.

When online bank Egg upgraded its website in May 1999, new security measures scrambled online session protocols and allowed users to see banking details of other customers (BBC 2000).

In November 1999, the UK Halifax bank suspended its online share dealing service, after an attempt to fix a bug backfired. Again, account details were made available to other users (BBC 2000).

Barclays, which claims to be the UK's largest online bank, had to take down its Web site at the end of July, when customers were served the bank statements of other clients (Knight 2000a, Knight 2000b).

Western Union, part of Atlanta-based electronic payments giant First Data Corp., implemented a new Internet-based person-to-person payment service but the site was hacked during a routine maintenance operation that erroneously left parts of the site exposed (Creed 2000). A report by Associated Press detailed how hackers broke in and copied the credit card and debit card details of 15,700 Western Union customers who use the site to transfer funds across the Internet (Guterman 2000).

This paper is concerned with the service of Internet Banking and the issues surrounding authentication, which is the mechanism at the heart of E-commerce security. The content draws a correlation between the concepts depicted in figure 1, by presenting a framework that when applied to certain Internet Banking scenarios can offer

the customer guidelines regarding the implementation of appropriate authentication mechanisms to ensure an adequate level of trust between the parties conducting the transaction.

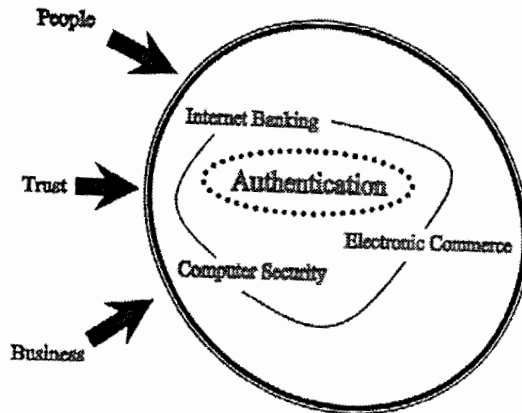


Figure 1: Security Issues of Internet Banking

## THE FRAMEWORK OF AUTHENTICATION FOR INTERNET BANKING

The proposed model for identifying security requirements in an Internet Banking environment is intended to support the use in both business-to-business and business-to-consumer E-commerce. Organisations, small to medium sized enterprises (SME's) and home-based customers shall be able to use this framework as a guide to identifying the security requirements for their particular banking environment. The objective of the scenario presented is to encourage a sense of confidence in the parties involved in undertaking Internet Banking transactions, such that their personal information is protected from prospective security breaches, alike to when Barclays, which claims to be the UK's largest online bank, had to take down its Web site at the end of July 2000, when customers were served the bank statements of other clients (Knight 2000a, Knight 2000b).

### Steps in the Framework Process

Traditionally security assessment has been undertaken by applying conventional risk analysis methodologies. These have become inadequate with the advent of open, distributed networks, requiring new approaches to risk assessment. Thus, the following framework aims to identify the security requirements for an Internet Banking environment. Developed from a framework for E-commerce security (Labuschagne, 2000), it consists of a defined six-step process.

- Step 1 List all the security requirements for an Internet Banking environment in general;
- Step 2 Identify all participants and stakeholders involved in the Internet Banking process;
- Step 3 Break down transactions into different autonomous actions;
- Step 4 Map these identified actions onto the participants involved, which serve as a model for the Internet Banking environment;
- Step 5 Use the information obtained in step 4 to determine the security requirements for a secure Internet Banking environment and
- Step 6 Use these security requirements to develop the security architecture, comprising suitable security procedures, mechanisms and policy.

Each one of these steps is further examined in the following sections.

### Security requirements for an Internet Banking environment in general

The close relationship that exists between E-commerce and Internet Banking means that an Internet Banking session must satisfy the same security requirements as listed below:

*Identification and* The ability to uniquely identify a person or entity and to prove *authentication* such identity:

- Authorisation* The ability to control the actions of a person or entity based on its identity;
- Confidentiality* The ability to prevent unauthorised parties from interpreting or understanding data;
- Integrity* The ability to assure that data has not been modified accidentally or by any unauthorised parties;
- Non-repudiation* The ability to prevent the denial of actions by a person or entity;
- Availability* The ability to provide an uninterrupted service;
- Privacy* The ability to prevent the unlawful or unethical use of information or data;
- Auditability* The ability to keep an accurate record of all transactions for reconciliation purposes.

These eight security requirements have been proposed as the basis for the E-commerce security framework (Labuschagne, 2000). To extend on this, authentication mechanisms need to be incorporated to provide the corner stone of authentication for the Internet Banking framework. This would comprise the use of passwords, smart cards and possibly biometrics.

The following section describes where these security requirements fit into an Internet Banking environment.

### The Internet Banking Environment

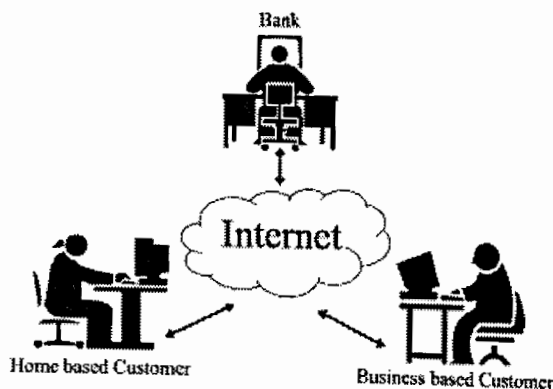
There are three main areas of security that are involved in Internet Banking. These are:

- The Bank;
- The Internet;
- The User's (customer) Computer.

The user's computer includes both a home customer as well as organisational customer using Internet Banking facilities.

The interaction between bank-to-bank Internet Banking has been omitted due to the discrepancy of different and advanced level of security provided at this level.

Figure 2 illustrates a simplified version of the Internet Banking transaction process through an Internet Banking environment where a customer/business wishes to pay a bill.



**Figure 2: Internet Banking environment**

In figure 2, there are two participants to any Internet Banking transaction, namely the customer that can either be home or business based and the bank. The important considerations like taxation and legislation across geographical borders have been omitted from the discussion for the sake of simplicity.

## DESCRIPTION OF THE SPHERES

Four spheres can be determined from figure 3. Each has its own unique security requirements based on the Internet Banking requirements outlined later. A sphere is defined as an independent entity consisting of a person, information technology or both. Figure 3 shows a representation of these spheres.

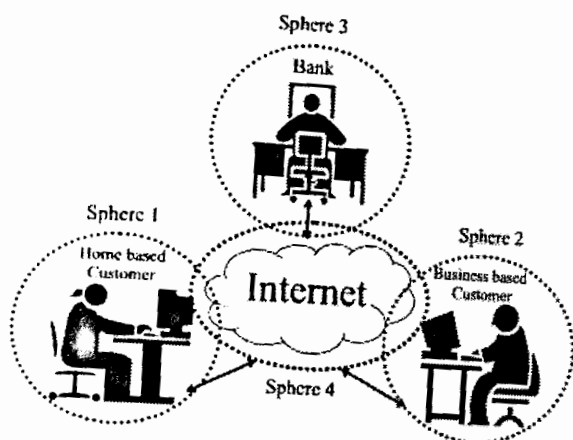


Figure 3: Spheres within Internet Banking environment

The following section defines and describes each individual sphere within the Internet Banking environment as depicted in figure 4.

### Sphere 1 – Home based Customer

This customer can be any home based user on the Internet. It is therefore not viable to determine or assume that such a customer has any security (authentication) mechanisms in place. The only assumption that can be made is that most home-based customers would use browsers that support digital certificates and the Secure Socket Layer (SSL). However it cannot be presumed that these customers have the knowledge or understanding of how to use this integrated functionality.

The nature of Internet Banking is such that the majority of home-based Internet users should be seen as potential customers and hence should not be prevented or hindered in any way from participating in an Internet Banking transaction. Thus for these customers, the partaking in an Internet Banking transaction should cater for secure and user-friendly operations in a convenient environment.

### Sphere 2 – Business Based Customer

This customer can be any business-based company on the Internet. The major difference between a home-based and business-based customer would be the implementation of some form of security mechanisms.

There are two distinct relationships that exist in this instance. Firstly the association of the business-based customer with the bank that represents a similar relationship as a home-based customer and secondly where the business-based customer acts as the merchant between the home-based customer and the bank. In the second scenario, the merchant accepts the responsibility for securing the transaction with the home-based customer before forwarding it to the bank. The merchant must, therefore provide assurance that an electronic transaction can be made safely and securely and that the risk has been minimised to an acceptable level for all participants.

In terms of the nature of Internet Banking, business-based companies are entitled to the same inclusions as home-based banking.

To maintain a level of simplicity, the electronic business environment, which comprises knowledge management and workflow, does not form part of the proposed framework, although it would be possible to adopt the framework for this environment.



### **Sphere 3 - Bank**

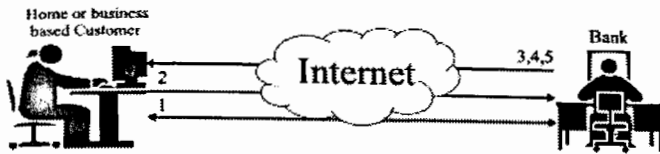
The framework regards the inter-network of banks as a single body as opposed to each bank being its own separate entity. The purpose of the banking sphere is twofold; firstly to validate customers through authentication mechanisms and secondly to authorise and honour transactions to ensure against non-repudiation.

### **Sphere 4 - Internet**

The Internet is considered to be a network of networks where there is no one single entity responsible for security or held accountable for any losses suffered. It is viewed as the infrastructure that facilitates global communication, leading to E-commerce and now Internet Banking. From its outset, the Internet in no way has existed to protect any of the participants but rather to provide a channel to facilitate the connection between different entities wishing to communicate via electronic means. Despite version 6 of the Internet Protocol (IPv6) being successfully proven in various test environments, version 4 (IPv4) is still the chief Internet protocol. Adversely IPv4 is absent of the security functionality included within IPv6. Thus, the security of a message cannot be taken for granted.

## AUTONOMOUS ACTIONS CONTAINED WITHIN THE INTERNET BANKING TRANSACTION

Up to now the participants and the relationship between them have been explained. The next step is to analyse and divide the transaction into smaller, autonomous actions that combined make up a complete Internet Banking transaction. A typical Internet Banking transaction consists of the following actions as illustrated in figure 4. Note that home-based and business-based customers are interchangeable.



**Figure 4:Autonomous actions contained within Internet Banking transaction**

- Action 1: - A customer uses the Internet to connect to their bank's Web site;
- Action 2: - The customer browses the Web site and decides on a service. An Internet Banking transaction is initiated by the customer by providing both invoice and payment information;
- Action 3: - The bank checks if the transaction is executable by verifying the customer has enough funds available and a reply is returned to the customer;
- Action 4: - Upon completion of the transaction confirmation is sent to the customer;
- Action 5: - The bank honours the payment and returns proof of having done so.

These transactions could be broken down further if deemed necessary. A decision table can then be used to assist in the identification of the essential security requirements for the Internet Banking environment as previously described.

## SECURITY DECISION ANALYSIS

The decision table as shown in table 1 illustrates an example based on the scenario outlined previously. A brief discussion of the steps to develop such a decision table is also provided.

Spheres		Step 3 Actions									Step 4 Mapping	
		A1	A2	A3	A4	A5						
Step 2	Customer	X	X		X							
	Internet	X	X									
	Bank	X		X		X						
Step 1	Security requirements											Step 5 Security framework
	Identification & authentication	X	X									
	Authorisation			X								
	Confidentiality		X		X	X						
	Integrity		X		X	X						
	Non-repudiation		X		X	X						
	Availability				X							
	Privacy	X										
Auditability			X		X							

**Table 1: Decision Table**

Following is a brief description of each of the steps.

- Step 1: - consists of listing all the security requirements that must be satisfied as discussed previously;
- Step 2: - consists of listing the spheres that have been identified. Only the three spheres shown in figure 3 are used i.e. bank, Internet and customer, whether home or business based;
- Step 3: - comprises listing the actions that make up a transaction. The five actions previously identified are used in the decision table;
- Step 4: - maps the actions onto the spheres identified in step 2. Naturally not all the actions will include all the spheres;
- Step 5: - associates the security requirements for an individual action.

This information is then applied to establish how it can be implemented within the relevant sphere.

In the decision table, action 1 shows that the bank must be able to identify and authenticate a customer satisfactorily to perform a transaction. At the same time the customer wants privacy regarding the personal account information being viewed. Privacy in this context refers to this information being unavailable to other parties. Actions 4 and 5 require the bank to send confirmation of the transaction and to ensure confidentiality and integrity of this message. Concurrently, the customer wants a guarantee that the bank cannot later deny that the transaction took place. This refers to the security requirement of non-repudiation. The table also indicates that the bank needs to record the transaction correctly in order to meet auditing requirements.

By looking at the security requirements for each action, it is possible to identify the security mechanisms required to secure the Internet Banking environment. For action 1, the identification and authentication security requirement could very well be facilitated by the implementation of a smart card authentication system possibly with an accompanying biometric mechanism. The required infrastructure through developed standards and technological know how has already been established for smart cards, providing certain support for this initiative. The security requirements for action 2 might suggest that SSL be used for securing the communication session (currently being used with 128-bit encryption) across the Internet. This may only be an interim approach or for the long term, depending on the implementation and widespread adoption of version 6 of the Internet Protocol (IPv6). Nevertheless it would be imperative to conduct timely checks on the protection provided by 128-bit encryption, with the high likelihood that it will be broken in the near future. The security requirements for actions 4 and 5 may be satisfied using SSL, although the acknowledgement needs to be digitally signed by the bank to conform to the security requirement of non-repudiation for all transactions. This would be catered for by the use of digital certificates.

## VALIDATION

For the purpose of this demonstration, the following provides an evaluation of one of the identified scenarios based on the developed framework constructed previously.

The first evaluation is based on the consumer-to-business E-commerce environment depicted in figure 5.

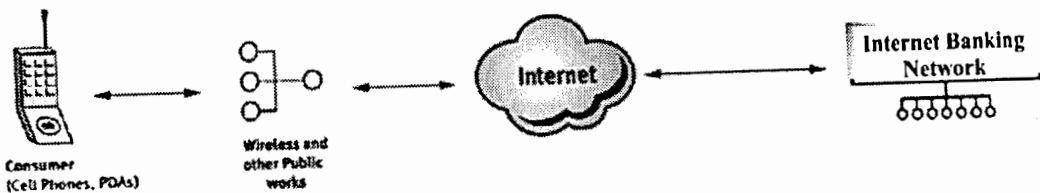
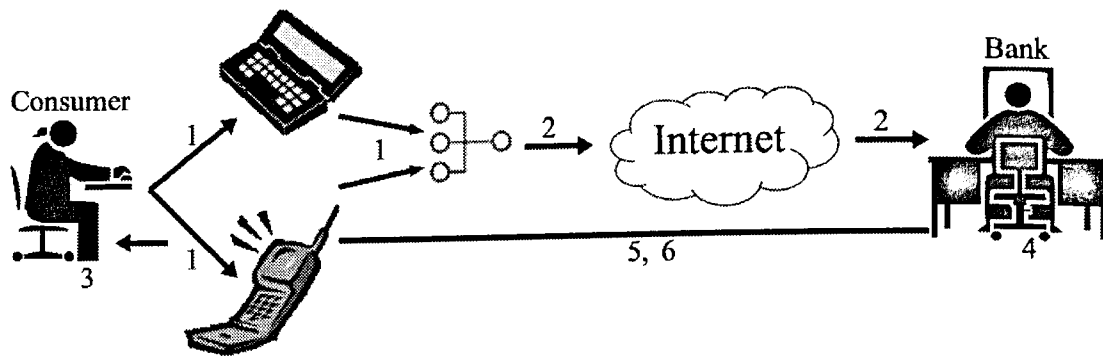


Figure 5: Scenario 7 Consumer (Cell Phones, PDAs)

In this scenario the areas that must be secured include:

- The consumer;
- The terminal (cell phone or PDA);
- The wireless and public network (telecommunication exchange);
- The Internet (communication server) and
- The Bank.

This is represented in figure 6 below that also illustrates the autonomous actions contained within this particular environment.



**Figure 6: Autonomous actions contained within the cell phone, PDA scenario**

Following is an explanation of these actions.

- Action 1 - consumer uses a mobile phone or personal digital assistant (PDA) to connect to a wireless or other public network.
- Action 2 - Through the telecommunication exchange and Internet, the consumer is able to connect to their bank's Web site.
- Action 3 - The consumer browses the Web site shown on their cell phone or PDA screen and decides on a service; i.e. Transfer funds from account A to account B.
- Action 4 - The bank checks the validity of the consumers' request.
- Action 5 - The bank sends the confirmation to the consumer upon completion of the transaction.
- Action 6 - The bank honours the transfer and returns verification to the consumer.

From this the decision table can be derived as shown in Table 2.

Spheres		Step 3 Actions									Step 4 Mapping
		A1	A2	A3	A4	A5	A6				
Step 2	Customer	X	X	X			X				
	Cell Phone, PDA	X		X			X				
	Wireless & other works	X	X	X			X				
	Internet		X			X	X				
	Bank		X		X	X	X				
Step 1	Security requirements										Step 5 Security framework
	Identification & authentication		X								
	Authorisation			X							
	Confidentiality	X	X	X	X	X		X			
	Integrity	X	X	X	X	X		X			
	Non-repudiation			X	X	X		X			
	Availability	X									
	Privacy				X			X			
Auditability					X						

Table 2: Scenario Decision Table (Derived from Table 1)

By viewing the security requirements for each action, the security mechanisms required to secure this Internet Banking environment can be suitably determined. For example confidentiality can be assured by a smart card acting as a veritable lock between the secret code on the chip and the unsecured terminal (in this case the cell phone, PDA, and telecommunication exchange) environment. In addition authentication can be provided for via the use of a PIN as well as an integrated digital signature and digital certificate associated with a smart card system. Further data integrity can be catered for via the use of Message Authentication Codes that are in-built into the Secure Socket Layer (SSL), which can be used for securing the Web session over the Internet. To prevent Internet based users from breaching the banking network, a firewall should be implemented to isolate the Web server from the customer information database.

Finally, by complementing the identification and authentication process of Internet Banking based transactions with technologies like public-key cryptography, digital notary and digital signature, repudiation of transactions is protected.

## CONCLUSION

The entities involved in the transaction including the technological components are clearly defined and arranged accordingly. Naturally the various entities will require different security requirements based on their interaction within the specified Internet Banking environment. The model caters for this determination by providing a detailed decision table that amalgamates all the information gathered in the six-step process. This valuable cross-referencing method ensures that all avenues from whence contingencies arise are covered.

The framework of authentication for Internet Banking allows customers to work their way through each step, identifying the necessary security requirements along with the counteracting authentication mechanism. The distinctive style of the framework including explicit descriptions, examples and cross-referencing capability ensures all security requirements and authentication mechanisms are sufficiently identified for correct and effective implementation.

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# Security Issues of M-Commerce

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## ABSTRACT

*The advancement in wireless communication and economical, portable computing devices has made mobile computing possible. This paper explores the new era of e-commerce, now being commonly referred to as mobile commerce or m-commerce. Firstly the current stance and future outlook of this new commerce initiative is presented along with key mobile technologies that are providing the backbone for the mobile services on offer. For businesses to remain competitive and merge m-commerce with existing business activities, means dealing with implications such as cost, usability and security, which are defining the uptake of the new tools that are enabling m-commerce. This leads to discussing the critical security issues pertaining to a mobile commerce environment.*

*Keywords: M-Commerce, Security.*

## INTRODUCTION

Information access any time, anywhere, any place. While e-commerce provides access to anyone at any time, m-commerce provides the next dimension, with access to anyone from anywhere. M-commerce applications are suspected to span from simple banking on the move to enabling financial settlement for every e-commerce transaction undertaken via a user's portable device including insurance, loans and credit services as well as stock broking and transactional financial trading facilities. Mobile devices will become truly ubiquitous when they embody speech recognition technologies and operate over the new high bandwidth third generation networks (Dennis 2000).

The impact of proficient security in a m-commerce world can be gauged from a recent survey that showed 80% of respondents felt that security and usability were the issues requiring the most urgent treatment with technologies such as the Wireless Application Protocol (WAP) (IT-Director.com 2000c). Another survey suggests people are not exactly overjoyed at the prospect of the wireless Web. The majority of the 1700 people queried revealed that they either would not use or would not pay for m-commerce or m-services. Among those who do not own cell phones, 56 percent indicated their unwillingness to do so. Among those who own cell phones, 48 percent expressed similar resistance. Although the survey did not reflect total opposition to using the Web via a cell phone or a personal digital assistant (PDA), with just less than half of the respondents telling they would use their phones to check email or read news, the immediate future of m-commerce looks grim with only 10 percent saying they would make retail purchases on the wireless web and fewer still indicating their willingness to conduct stock trades (Lindsay 2000).



## MOBILE SERVICES

The successful services facilitated via the wireless Internet shall reflect the unique characteristics of mobile access. Namely, timely provision of information when it is most relevant, the ability to access information from any location outside of the office and the relating of information to the current location of the user. These comprise both pull services, where the user consciously connects to obtain information as well as push services, where information is provided under predetermined conditions, often using the Short Message Service (SMS) on Global System for Mobile Communication (GSM) networks. Table 1 displays a breakdown of the services with regard to mobile benefits (ARC Group 2000).

Timeliness	Remote Access	Location Based
Email alert	Intranet access	Traffic conditions
Fax alert	Transport schedules	Weather details
Stock details	Dealing in shares	Transport schedules
News headlines	Altering travel arrangements	Navigation
	Vertical support for sales staff	Entertainment/dining details
	Banking	
	Unified messaging	
	Entertainment booking	
	Internet access	

**Table 1: Services with Regard to Mobile Benefits.**

The most useful services for consumers given cost effective communication prices include obtaining traffic information or email on WAP, as well as the ability to trade online via WAP (Schuenung 2000).

The drive for m-commerce will naturally come from meeting the needs and applications of its users, each with different usage profiles (IT-Director.com 2000a).

## KEY MOBILE TECHNOLOGIES

The following provides a brief description of the key mobile technologies that are enabling m-commerce (Langley 2000). Some of the related security dilemmas are covered in the subsequent section.

**Bluetooth:** low power radio technology replacing wires connecting devices such as PCs, printers, palm tops and mobile phones. Data can be exchanged at up to speeds of 720kbps over distances of up to 10m. The security issues of Bluetooth still has to be assessed.

**GPRS:** General Packet Radio Service is the first implementation of packet switching within GSM, which is essentially a circuit switched technology. GRPS will send and receive data at up to 115kbps and brings IP capability to GSM.

**GSM:** Global System for Mobile Communications is the pan-European standard for digital cellular networks that has been widely used around the world.

**Sim:** Subscriber Identity Module Application Toolkit: Sim cards provide users with authentication to access the network. Using the toolkit, the Sim card can be programmed to perform new operations, personalising the phone to the user.

**Smart Phones:** GSM terminals that enable users to access e-mail, faxes and company intranets. Smart phones have larger displays, QWERTY keyboards and integral software links to services and applications.

**Symbian:** partnership between Psion, Ericsson, Nokia and Motorola to promote the Eloc operating system for wireless information devices. Symbian partners work to make key mobile standards possible, like WAP, Bluetooth and Java.

**UMTS:** Universal Mobile Telecommunications System is building on existing GSM infrastructure. UMTS networks will offer true global roaming and are able to support a vast array of voice, data and multimedia services at speeds of up to 2mbps. Commercial UMTS networks are expected from 2001.

**WAP:** Wireless Application Protocol provides mobile terminals with access to the Internet. This protocol facilitates for narrowband radio channels and the limited displays and functionality of today's mobiles.

**Windows CE:** Microsoft's operating system for palmtops.

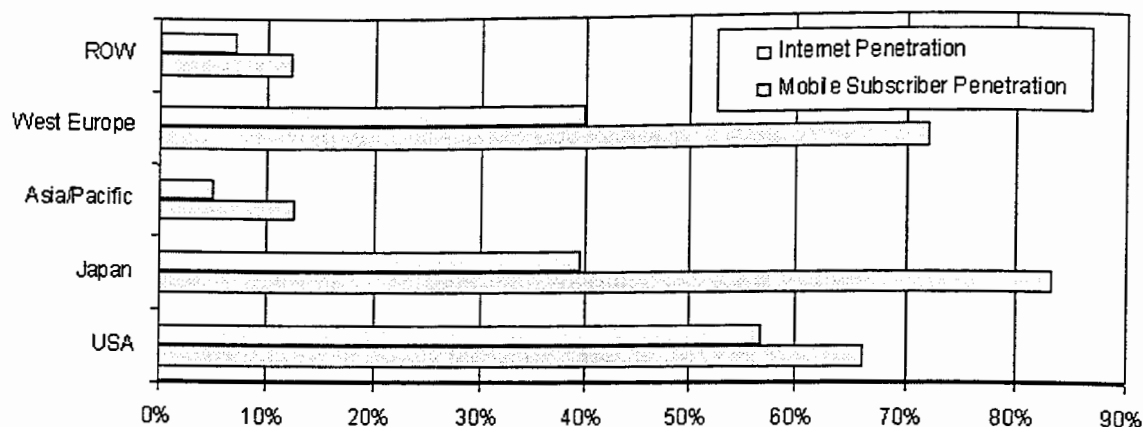
**3G Networks:** 3G otherwise known as third generation networks will have broader bandwidth, 'always on' internet connections and more sophisticated devices allowing data to be conveyed visually as opposed to in a text-based format. Heralded as enabling true mobile e-commerce, 3G networks will facilitate two-way communication allowing transactions to be conducted online.

Ensuring transaction security and usability while providing multi-browser support, multi-device support and integration with corporate data and applications is depleted with inconsistent service and lack of standardisation across these systems and devices. Despite these technologies having built-in security mechanisms to ensure transactions in transit over the wireless Internet are safe and secure, they still have associated security implications. Even though the Wireless Transport Layer Security (WTLS) protocol, which is based on the Secure Socket Layer (SSL) and Transport Layer Security (TLS) protocols from the Internet, has been included in WAP since the release of version 1.0, none of the commercially available WAP gateways actually implements the security protocol. In effect, there is no security in today's WAP applications with existing products. So far security at the WAP Gateway is mainly based on trust in the gateway operator (Brooks 2001).

## **FORECASTS FOR M-COMMERCE**

M-commerce is accelerating faster than Internet time. In 1999, there were approximately 200 million users, compared with 400 million cell phone users. The natural trend as cell phones become increasingly Web-ready would be that those 400 million cell phone users would add to the growing global base of m-commerce customers (Simon 2000).

The number of mobile subscribers in 1999 (428 million) already greatly exceeds that of Internet users (241 million) and is anticipated to develop to exceed one billion by 2003 (ARC Group 2000). To the majority of this group wireless access to the Internet has proven to be unappealing due to the low bandwidths and high costs of access such that mobile data users only represented 7 percent of mobile subscribers in 1999 (ARC Group 2000). The situation is beginning to turn with the launch of IP based value added services. This does not include Internet browsing, as it is presently known, rather the provision of a package of information services that source their data from the Internet. Figure 1 displays a graph showing a forecast of Internet and mobile subscriber penetration for 2004 (ARC Group 2000).



**Figure 1: Forecast Internet and Mobile Subscriber Penetration for 2004**

The demand for m-commerce has been substantiated by a recent report that I-Mode-friendly Japan, despite being in the middle of a recession, was already generating \$400 million worth of revenues via mobile phones. It seems that end-user interest in WAP is also high. This was shown in a report produced by NOP in May 2000 that confirmed that one in ten UK Internet users intended to buy a WAP phone within 12 months. This factor is significant given that 65% of those surveyed already owned a mobile phone (IT-Director.com, 2000b, 2000c).

### M-COMMERCE SECURITY

Secure m-commerce faces various dilemmas from the size of digital certificates to poorly planned legislation. Specifically problems with mobile technologies, European Union legislation and design issues with interfaces are holding back electronic transactions over the Wireless Application Protocol (Loney 2000). The mere sizes of digital certificates are too large because of the way they are chained together for trust. Fragmentation of security models is also a problem where there are several proprietary solutions with no single standard or framework for secure transactions to work from. The lack of 128-bit security on early WAP phones has also been an issue especially for businesses where 128-bit encryption is a necessity. Other problems exist like in the UK where the Customer Protection (Distance Selling) Regulations 2000 mean that the consumer must be presented with the entire agreement before they can purchase anything (Loney 2000). Naturally it is not practical let alone feasible to effectively display a 20-page agreement on a mobile phone display. With regards to the user interface, keying in passwords can even prove to be problematic especially when manufacturers set up their phones, assuming that the first character will be a capital. There is also the reduced protection caused by the narrow bandwidth, the short identification keys, and the vulnerability of the device itself to theft. Even though keys can be stored on the Wireless Identification Module (WIM)/Security Identification Module (SIM), they are only as secure as the PIN number needed to unlock the phone (Brooks 2001). There is also the risk of transmission leaks. Specifically, the job of base stations is to decipher the digital data from the air before sending it to the rest of the network. In this way, transmissions between base stations and central office switches have little or no security (Brooks 2001).

Although Wireless Internet Devices (WIDs) offer organisations the advantages of greater network connectivity and mobile Internet access, they also pose serious security risks. Exposure from significant security breaches may emanate from two main dilemmas (Johnson 2000). The first is that development of security technologies lags behind the introduction of WID-based operating platforms meaning that there are fewer available security solutions available for WIDs. The result is that security policies and technologies may be unable to be deployed on some or all of the organisation's WIDs. Thus, an unauthorised user (employee, sub-contractor or other 'trusted' insider) may be able to access applications and confidential information for which they do not have permission. The second problem relates to security officers who may well find it difficult learning and deploying security

policies on such new and complex technologies. Even in cases where security systems have been designed to be compatible with wireless operating systems, security officers may lag behind in their understanding of which technologies like WIDs, rather than their security risks, organisations need platform-independent solutions that can be implemented regardless of the specific network architectures and technologies they are intended to work with.

There is also the issue of viruses. Phones and PDAs are adding scripting languages of their own, which could be very attractive to virus writers. Sun Microsystems last summer announced Java2 Micro Edition (J2ME), a version of the popular language designed for mobile devices. Like its bigger brother, Micro Java lets programmers write applets that will run on any platform, regardless of the underlying operating system or processor. A greater threat than Java is Wscript, the scripting language built into WAP. Wscript is less secure than Java. WAP gives scripts direct access to telephony functions, designed for applications such as online directory assistance. This means that a virus could work its way through a user's phone book, calling everyone to transmit a copy of itself. Users of the Japanese NTT DoCoMo network have already experienced something like this, thanks to a PC-based virus. For example, the Timofonica worm is written in Visual Basic Script (VBS) and operates under Windows and uses Microsoft's Outlook address book to spread itself via email. It also sends SMS text messages to random mobile phone numbers. SMS itself does not present a virus threat because it is pure text and cannot carry executable code. However, Timofonica exposes the vulnerability of mobile networks to virus attacks (Brooks 2001).

As more users move away from their own desktop and access the Internet remotely, protecting their data against security breaches will once more be a critical issue. The development of smart card technologies in previous systems offers a good grounding for data protection and authentication for surfers on the go, making commerce secure and reliable. However, these implementations have typically required a password or PIN that are too easily forgotten or forged. Also businesses still deal with customers who say 'I didn't do that. Someone else bought it'. The trend is to move towards a biometric system where it is thought that measuring physical characteristics to verify a person's identity offers greater protection in the e-commerce era (Yackley 2000). With biometrics such statements could not be falsified as the physical item belongs only to that person. Biometrics includes voice recognition, iris and face scans and fingerprint authentication. Fingerprint identification is likely to win out over eye and face scans because it is much cheaper and does not carry the same negative connections. PC manufacturers like NEC are currently selling keyboards with fingerprint sensors with prototypes of mobile phones with sensors on the handset in development. Veridicom, a Santa Clara, California company has introduced fingerprint-ID technology with its smart cards. As opposed to digital certificates and other browser-based security measures that just sit on the users computer, Veridicom's Match-on-Card, is arranged such that the fingerprint template remains on the card. This technology that authenticates fingerprints without transferring the data to a PC or cell phone, means that the user is in control of their electronic signature, because it is on their finger. It is expected that the widespread use of smart card biometrics in cell phones will take another two or three years (Yackley 2000).

The arrival of third-generation (3G) cellular networks, wireless application protocol (WAP) and mobile m-commerce further undermines the issue of security on users' personal devices and can be used with all major bearers such as CDMA, TDMA, etc. It is imperative to find an effective solution to this matter as consumers are more conscientious about security than they used to be with lack of security being consumers' biggest fear when performing an e-commerce transaction (Gale Group 2000). To combat these security issues, RSA Security has released the Wireless Transport Layer Security (WTLS) protocol, optimised for use over wireless communication networks. Also RSA has unveiled the RC5 encryption algorithm - part of the WTLS specification - to the WAP Forum standards body and partnered with Nokia, Ericsson, 3Com and others involved with wireless devices to embed its BSAFE products in its partners' offerings (Gale Group 2000). Due to the continued development of WAP, the latest security information regarding WAP can be found via [www.wapforum.org](http://www.wapforum.org).

With regard to securing against viruses, F-Secure Anti-Virus for WAP Gateways is the first product that protects wireless communications, transactions and m-commerce from new and emerging vulnerabilities. F-Secure Anti-Virus for WAP Gateways provides protection against malicious code by checking for viruses and Trojan horses in the content to be transferred to WAP enabled devices. The product detects and disinfects WAP-related malicious content transparently and automatically, providing timely updates of malicious code detection activity. By doing this, it proactively protects the infrastructure, users, their terminals and phone bills as well as their sensitive data.

From the perspective of the WAP Gateway, the solution appears as an HTTP proxy as shown in figure 2, making it easy to add content security to WAP and other HTTP-based architectures. The advance virus signature database is specially designed to handle mobile terminal type patterns, while the automatic update feature ensures that the database is always up-to-date (Brooks 2001).

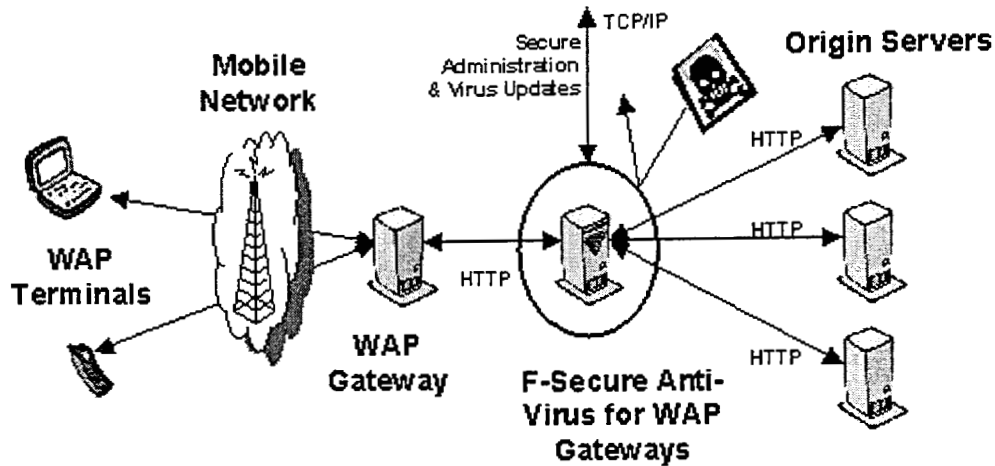


Figure 2: Representation of anti-virus software within the WAP network.

In tackling this new wireless frontier Hewlett Packard Internet Security Solutions Division has integrated the HP Praesidium VirtualVault into its WAP server solutions. More than 120 banks in 24 countries – with combined assets exceeding \$7 trillion – already rely on VirtualVault. Integrated with Nokia and Tantau WAP servers, VirtualVault now protects the WAP server, as well as the Web server, and controls access to back-end applications. As a result, this configuration protects internal resources, transactions, and business relationships from sophisticated security attacks (Brooks 2001).

The trusted WAP solution sits on the border between the outside world and the enterprise to safely connect applications and databases to mobile users as shown in Figure 3. VirtualVault controls all communication between the internal and external compartments. This solution can be deployed in any type of network, including mobile operator and company-specific networks, in a matter of days. In most cases, no changes to legacy systems are needed. For configurations with existing Web servers, the trusted WAP server can be added as a thin layer to this configuration, maintaining the existing investment. Alternatively, a separate WAP delivery channel can be constructed (Brooks 2001).

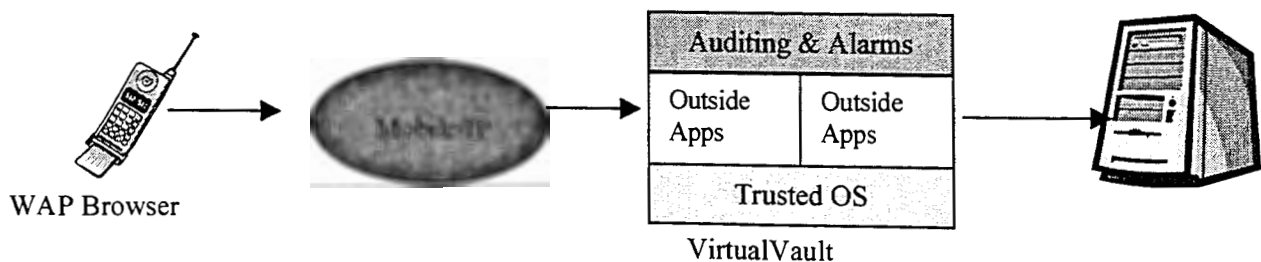


Figure 3: The Hewlett Packard VirtualVault

When it comes to the issue of security it seems that the continents are somewhat separated between a cash and credit card society. It is apparent that Americans are not acculturated to smart cards that are more suitably fitted to the European mentality. Similarly it seems that Americans live in a credit society as opposed to Europeans who still prefer to use cash because of their fear of privacy compromises. This apprehension has resulted in lower rates of e-commerce where for instance, in Germany, only 23 percent of Net users made online purchases with their credit cards in 1998 (Yackley 2000). America's endearment with the use of checks is another obstacle in the growth of wireless e-billing. Notably America is the only industrialised nation where the quantity of checks used actually increases every year (Koller 2000).

## CONCLUSION

M-commerce offers much for businesses and consumers alike. Domestically and internationally the trends point to the number of phones sold exceeding PC sales. Nevertheless, even when the much talked about 3G video-capable high-speed phone services are available – which are not expected to arrive before 2005 in the US – Web content on phones will vary a great deal from that viewed on a PC. With legal and standards issues still to be developed, it seems that the phone will augment rather than replace the PC for the time being. The immediate outlook for m-commerce will be dependent on obvious navigation, concise content as well as automated navigation with other channels. The main barrier to success of new technologies and applications built upon them is convincing users to upgrade to next generation services. Like with e-commerce this will not eventuate until a secure level of trust can be established between the user, the technologies and the service provider.

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# Virtual Organising in a Floating Production Storage and Offtake Oil and Gas Project

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## ABSTRACT

*This paper describes a strategy for organising large scale one-off engineering design and construction projects in which major components have to be concurrently purpose-designed and constructed in different parts of the world prior to final assembly on site. In the case of the Floating Production Storage and Offtake (FPSO) facility selected for the development of the CNL oil and gas field off the northern coast of Australia, a combination of co-located and geographically dispersed teams from various participating organisations collaborated using an integrated project information system. The experience of this project suggests that the establishment of the requisite information systems infrastructure should be supplemented by an infostructure tailored to the needs of the participating organisations. Furthermore, a sympathetic infoculture is required in the participating organisations to ensure commitment to and consistent use of the integrated project information system.*

*Keywords: virtual organising, integrated project information system, engineering and construction projects, oil and gas, FPSO.*

## INTRODUCTION

New oil and gas fields are continually being brought onstream to satisfy the increasing global demand for energy and to replace the depleting reserves of existing fields. These new fields tend to be located in remote offshore areas. The FPSO arrangement is a popular method for developing such remote offshore fields, particularly those located in deep water.

A typical FPSO comprises a ship-shaped hull which provides oil storage and supports process facilities on its deck, as shown schematically in Fig. 1. The hull weather-vanes around a turret mooring system which anchors it to the seabed. The oil field is drained via a number of subsea wells which are drilled before the FPSO arrives on location. The wellheads and manifolds on the seabed comprise the subsea production system and are connected to the FPSO by a system of flowlines and risers. Fluids from the wells travel along the flowline / riser system and enter the FPSO via special swivels in the turret mooring system.

Gas and water are separated from the crude oil in the process facilities. Some gas is used for power generation and the balance is either flared or compressed and reinjected back into the oil field. The crude oil is stored in the hull and periodically pumped to shuttle tankers that temporarily moor to the stern of the FPSO.

The expertise for designing and building all the major components of a FPSO are difficult to find within one company. The hull and its associated marine systems are usually designed and built by a vertically integrated design and construction team in a shipyard. The turret mooring system is the expert province of a company that owns the technology for the special fluid swivels. Likewise, the



flexible risers and flowlines can only be reliably designed, supplied and installed by a handful of companies worldwide. The process facilities are designed and built to normal oil and gas industry standards with some minor modifications to account for the movements of the FPSO. There is usually an overall control system which links all the major components back to a central control room located in the accommodation block on the deck of the FPSO.

Such projects are generally one-off as the major components have to be specifically tailored to the characteristics of the particular oil field, eg well flow rates, fluid composition, pressure and temperature profiles, as well as the site environmental and geotechnical conditions.

Quite apart from the economic pressures to bring every field onstream as quickly as possible, there are also many design interfaces and overall technical integrity considerations linking these major FPSO components which necessitate their concurrent design and construction. Whilst co-location of the design teams is preferred for ease of communication and management, this is often not practicable for FPSO projects because of the geographically dispersed locations of the participating expert companies which may be supporting a number of projects worldwide at any one time.

Although a few shipyards are capable of constructing the hull, process facilities and turret in one location, this is not the usual arrangement. Most oil and gas clients prefer to award construction of the process facilities to fabrication yards with good track records for similar construction for the oil and gas industry. There is also the usual reluctance to place "all the eggs in one basket". The turret mooring system, including the fluid swivels, is often provided as a design-construct package by the expert company. Other specialist suppliers provide the flexible risers, flowlines and overall FPSO control system.

Hence, a FPSO oil and gas project presents the challenge of successfully organising a large scale one-off engineering design and construction project in which major components have to be concurrently purpose-designed and constructed in different parts of the world prior to final assembly on site.

One solution to this problem is to use a combination of co-located and geographically dispersed teams from the participating organisations who collaborate using an integrated project information system, as illustrated in the following case.

## **THE CNL FIELD DEVELOPMENT**

The CNL field, located in deep water off the northern coast of Australia, was discovered in late 1995. After feasibility studies by the client, Enercorp, the decision was taken to develop the field using subsea wells and a permanently moored FPSO unit.

The well fluids are stabilised on the FPSO and the produced light crude oil is exported through an offloading hose to tandem moored trading tankers. The purpose-built hull is designed for a 20 year working life and has a 1.4 million-barrel storage capacity. The process facilities located on the deck of the hull are designed to handle an oil production rate of 170,000 barrels per day.

### **Key Players and the Major Contracts**

Late in 1996, Enercorp awarded the contract for designing and constructing the FPSO to the Norway Monaco Consortium (NMC) formed by the multinational Norwegian Engineering Company (NEC) and the mooring systems specialist Monaco Mooring Systems (MMS). To shorten the overall project duration, Enercorp negotiated and awarded a contract for design and construction of the hull to Korea Shipyard (KSY) in parallel with its negotiations with NMC. This hull contract was then novated by Enercorp to NMC to manage as part of the FPSO contract.

Within the NMC, NEC was responsible for overall process design and technical integrity of the FPSO. MMS designed the turret mooring system in its Monaco head office and subcontracted fabrication of the system to Abu Dhabi Fabricators (ADF). NEC designed the process facilities in its Norway office and subcontracted fabrication of the key process modules to Australia Constructors (ACON) and the balance to Singapore Shipyard (SSY). Hundreds of purchase orders were also placed by NEC's project procurement team in Norway for equipment to be incorporated into the process facilities. SSY also won the subcontract for the assembly, hookup and commissioning of the FPSO after delivery of the hull, turret and remaining process modules to Singapore.

Enercorp awarded the contract for the design, construction and offshore installation of the subsea production system, flowlines and risers to another consortium, Subsea Flowlines Offshore (SFO). SFO subcontracted the design and construction of the subsea production system to Scotland Subsea Technologies (SST) who carried out the design in Scotland but fabricated the system in Australia. SFO was also responsible for towing the assembled FPSO from Singapore to the CNL field off the northern coast of Australia. The flowlines and mooring chains previously installed on location by SFO were then connected to the FPSO for final commissioning tests and commencement of production in late 1999.

Both NMC and SFO worked closely with Australia Control Systems (ACS), the specialist company engaged by Enercorp for the design and supply of the overall control system for the FPSO and the subsea production system.

The FPSO contract hierarchy and contract boundaries are illustrated in Figs. 2 and 3 respectively. This contracting approach was adopted by Enercorp to motivate the two main consortia, NMC and SFO, to manage the many interfaces within their respective boundaries of responsibility, in theory requiring Enercorp only to adjudicate between them.

Enercorp also encouraged SFO and ACS to use NEC's integrated project information system (IPIS) which was adopted by NMC as a means of coordinating all the concurrent design and construction activities by the combination of co-located and geographically dispersed teams.

### **The Project Schedule**

The original 30-month project schedule was extremely ambitious and partly depended on NEC successfully repeating the fast-track approach based on overlapping design, procurement and construction activities as used on an earlier FPSO project in Norway.

Much of the previous success was attributed to the use of IPIS which integrates design and information management and facilitates the systematic tracking of completion status of the many elements which make up a FPSO.

In the case of the CNL project, practical difficulties were experienced in the implementation of this concept, as elaborated later in this article. This contributed in turn to a significant overrun in the project budget and a 39-month schedule as outlined in Figure 4. It would appear, however, that such overruns and delays are not uncommon for FPSO projects (Rosi, 1999).

### **The Project Organisation**

A Project Manager who reported to the Enercorp Project Manager as well as the respective consortium board led each consortium. Within each consortium, the teams were generally organised in a traditional hierarchical structure centred around individual major components, and with access to shared project support services. Interface engineers were located within each team to coordinate technical interfaces with other components. NMC also established a separate team to ensure that overall technical integrity was maintained while design of the components progressed concurrently.

The project kicked off after Enercorp in Australia completed feasibility studies. Enercorp supervisory personnel were then located in contractor design offices in Norway (NEC for process facilities), Monaco (MMS for turret mooring system), Korea (KSY for hull) and Australia (SFO for subsea system and ACS for integrated control system) as the major component contracts were progressively awarded. This trend continued as the fabrication of the major FPSO components started in Korea (hull), Abu Dhabi (turret), Singapore (process facilities and FPSO assembly) and Australia (process facilities and subsea systems). NMC and SFO personnel were also sent to supervise their respective fabrication subcontractors in these countries.

The site teams reported back to their respective consortium design offices. The NMC project management team moved from the NEC design office in Norway to Australia when the design of the process facilities was almost complete. Hull construction was already well advanced by that stage and fabrication was underway on the process facilities in Australia and Singapore. A few NEC design engineers and procurement personnel remained in Norway to complete their outstanding tasks. The SFO design office was located in Australia and liaised with the SST office in Scotland responsible for the design of the subsea production system.

### **The Integrated Project Information System (IPIS)**

As a major engineering contractor in the Norwegian oil and gas industry, NEC has developed a sophisticated integrated project information system (IPIS) to manage the multidisciplinary technical information progressively created in the course of a typical oil and gas project. This information is vital for interface management, project control and maintaining overall technical integrity. It also captures a lot of the information required for subsequent commissioning and operation of the facility.

IPIS integrates computerised design tools and associated database systems into a comprehensive and controlled environment. All common data from the various application systems are uniquely and commonly defined and stored in a core database as shown in Fig. 5. This minimises data duplication, enhances overall data integrity and facilitates the meticulous change control necessary for managing design optimisation in complex projects. The system also enables timely incorporation of as-built or vendor information into ongoing design, construction, commissioning work and ultimately into reference documentation for operational use.

IPIS applications include 3D design, materials management, systems engineering, piping and instrumentation design, project completion and document management. Other non-integrated systems communicate with the common database via a standard import/export interface.

In the case of the CNL Project, IPIS was available to the various design offices and construction sites in Norway, Monaco, Abu Dhabi, Singapore, Australia and Korea via a dedicated project Wide Area Network. The main server was originally located in the NEC office in Norway and subsequently shifted to the NEC branch office in Australia when the NMC project management team was relocated. Fig. 6 depicts the WAN structure after the relocation.

Local Area Networks were also established in each project office and site. Email was used extensively for communication within the project and with other organisations involved in the project.

Use of IPIS was fundamental to the overall management of the CNL project given the many concurrent design, procurement and construction activities taking place all over the world. Interfaces were modelled using the 3D design system and all project documents and correspondence were stored in the document management system. The weight control module was used to track dry and operating weights of all components as this was important for structural design and overall weight control of this floating facility.

However, a number of problems were experienced with the use of IPIS on the CNL project.

One major difficulty was the fact that the system has been developed primarily for NEC work in Norway. The Norwegian oil and gas industry is a close knit community of client, engineering, supplier and construction organisations that have mutually benefited from the long-standing relationships arising from the continuous stream of contracts and orders awarded to local firms over the last two decades. These relationships, which encourage active information sharing and trust, were difficult to replicate in the short term with the other organisations participating in the CNL project who had not previously worked with NEC.

It also transpired that some of the Norwegian industry work practices and interfaces on which IPIS is based were not norms for the other organisations involved in the CNL project.

Most NEC personnel had developed familiarity with IPIS as it evolved over a period of years. However, IPIS proved to be a very steep learning curve for non-NEC personnel on the CNL project - partly because of its complexity and partly because of their lack of familiarity with the way in which information was structured within the system. Ironically, the fact that most personnel used English on the project actually caused a degree of confusion - it transpired that in some cases the same words were being used with (slightly) different meanings!

The very tight project schedule meant limited time and resources for training non-NEC personnel who often had to rely on available NEC personnel to assist them as they learnt to use the system. The staggered commencement of project personnel also meant that there were always new people learning to use IPIS. These problems were particularly acute for the offices and sites outside of Norway.

The one-off nature of the project may also have affected the readiness of some NEC personnel to fully transfer skills in the use of this strategic tool to non-NEC project team members. Likewise, non-NEC personnel may also have been reluctant to invest the significant effort required to master this tool.

Some remote offices and sites also experienced problems with system response speeds, probably due to bandwidth limitations in the local communications infrastructure. Data replication was also an aspect that required frequent attention.

As a result of these difficulties, most non-NEC personnel ended up using only the document management system in IPIS. The relevant data from non-NEC components had to be input into the other IPIS applications by NEC personnel.

The document management system incorporated a sophisticated electronic workflow function which was very efficient in the distribution and tracking of documents, including correspondence, drawings, specifications, reports and vendor data. However, not all project personnel were fully committed to the use of this system – possibly due to the general lack of familiarity of some non-NEC personnel with fully electronic document management systems. The complexity of the document management system also meant that a team of NEC document controllers had to be relocated from Norway to Australia when the main server was shifted with the project management team. It then took several months to transfer the requisite skills before local Australian personnel could run the system.

Non-electronic project information was scanned into the document management system, in theory enhancing the availability of information to all project personnel. However, backlogs in scanning the huge amount of project documentation and inconsistencies in indexing often caused difficulties for personnel dependent on this information for design and construction work.

Apart from email and IPIS, project personnel communicated by phone and fax. Video-conference meetings were held regularly between the project management team and the construction site teams. However, information overload proved to be a problem for key personnel such as the project managers, supervisors and coordinators. This was compounded by occasional overzealous use of the

highly efficient electronic document distribution system to push documents to people who did not really need to review or read the documents.

Despite the problems encountered, it is difficult to envisage how the huge amounts of information that had to be shared "in real time" amongst the geographically dispersed teams (and even within co-located teams) could have been managed without a similar sort of electronic information system. After the FPSO commenced operations, the document management portion of IPIS was retained for retrieval of historical information by the operations team.

## CONCLUSION

Oil and gas fields developed using the FPSO approach face the challenge of successfully organising large scale one-off engineering design and construction projects in which major components have to be concurrently purpose-designed and constructed in different parts of the world prior to final assembly on site.

One solution, as demonstrated on the CNL oil and gas field development, involves a combination of co-located and geographically dispersed teams from various participating organisations who collaborate using an integrated project information system (IPIS).

Despite a substantial investment in a sophisticated WAN spanning a number of countries, there were quite a few infrastructure issues regarding bandwidth, response time and data replication that had to be addressed on the CNL project.

IPIS had been developed over the years to suit the design and construction interfaces, procedures and practices in the Norwegian oil and gas industry. Not surprisingly, a number of infrastructure issues arose when shipyards and fabricators in Korea, Singapore, Australia and Abu Dhabi had to interface with the system.

IPIS had previously been used successfully in the environment of active information sharing and trust prevailing in the Norwegian oil and gas industry as a result of business relationships built up over the last two decades. This infoculture did not necessarily extend to the other organisations participating in the CNL project, some of whom were dealing with NEC for the first time.

The one-off nature of the project may also have compounded the problem of IPIS skills transfer, already made difficult by the tight project schedule and limited resources. The end result was that the system was probably not used to its full potential in most areas of the project.

Despite all the problems experienced with the use of IPIS, the author is of the opinion that it was essential to the successful completion of the CNL project. The fact that the FPSO was able to exceed its nominal design throughput shortly after commencing oil production indicates that the complex technical integration of the components was successfully achieved. Furthermore the document management portion of the project information system remains in use today by the Enercorp operations team.

## DISCUSSION

The geographical spread of the various companies and teams which combined to deliver this project appears to satisfy the generic definition by (Lawrence, 1998) of a virtual organisation as

*'an amorphous entity which is a combination of different companies or individuals that have combined to complete specific projects or business propositions and development'.*

Interestingly, the CNL project was formally structured as an integrated hierarchical organisation. However, it was forced to function virtually because of the geographical dispersion of the various design offices and construction sites.

(Marshall, 2000) suggests that integrated organisations are preferred over virtual organisations when

- innovation is systemic rather than autonomous,
- information and knowledge flows are tacit rather than codified,
- ability to resolve conflicts is high rather than low,
- incentives for risk taking are low rather than high.

In the CNL project, innovation was generally systemic due to the complex interrelationships linking the major FPSO components. Change control was a major concern throughout the project duration. Changes were tracked via IPIS and authorised via the project hierarchy.

Much effort was expended in codifying and storing information in IPIS. All contractors were also required by Enercorp to provide specific documentation at various stages of the project eg specifications, reports, manuals, etc. However, design expertise essentially remained tacit, there being little motivation or time available for knowledge transfer. This was also partly true of knowledge regarding IPIS itself.

A large proportion of project management energy was devoted to conflict resolution because of the many interfaces involved and requirement for realistic compromises due to budgetary and time constraints – this was part of the reason for the integrated hierarchical organisation structure.

One side effect of the integrated organisation structure was to discourage risk taking. There was a constant tension between the desire for innovation (including continued design optimisation) and the drive to achieve project budgetary and schedule targets.

It is also interesting to compare and contrast the CNL project with the Virtual Cross-supply chain Concept development Collaborative (VC3) teams used by Boeing-Rocketdyne. In the case study reported by Carman (1999) an 8-person virtual team successfully designed a radically improved thrust chamber for a rocket engine. The team comprised five members from Rocketdyne, two from Raytheon (1000 miles away) and one from MacNeal-Schwendler (100 miles away) – all located in USA. The work was completed over 89 virtual meetings held over a 10-month period.

The main design phase on the CNL project lasted about 18 months. Several hundred people worked on the project. NMC personnel alone peaked at about 250 in Norway, 40 in Monaco, 40 in Korea and 15 in Singapore. Although almost all project personnel spoke English, differences in terminology and work practices did occasionally result in misunderstanding.

NMC, Enercorp and subcontractor personnel were typically co-located as integrated teams at each construction site and communicated with the other project design offices and construction sites via phone, fax, email and video-conferencing. Quite a number of project personnel never met their counterparts in other locations face-to-face during the project and relied exclusively on these communication methods and IPIS for collaboration.

Both the VC3 team and the CNL project used integration tools. The much larger scale of the CNL project required a more sophisticated integrated project information system which was the result of many years of development by NEC and which was regarded as a competitive advantage over its rival engineering companies. The VC3 team used Internet Notebook, an off-the-shelf product.

The VC3 team had the benefit of an existing Continuous Ordering Agreement which had been worked out between the participating organisations over the course of the preceding year. Although NEC and MMS had previously worked closely together, thus facilitating the formation of the NMC consortium

for this project, the other key players, including Enercorp, KSY, ACON, SSY, SFO, ACS and SST, had not worked with one another immediately prior to this project. The organisations were brought together via competitively tendered contracts and the tight schedule left little opportunity for developing the sort of trust-based collaborative arrangements enjoyed by the VC3 team. This may have affected the commitment by non-NEC personnel to use NEC's proprietary IPIS on the project.

Furthermore, the CNL project was NEC's first major FPSO contract involving relocation of large numbers of NEC personnel outside of Norway. Hence, the interface and information-sharing procedures and protocols had not been previously tested on a project as widely dispersed as this. The tight schedule, transient nature and number of project members would have made it very difficult to formulate coordination protocols in the collaborative manner employed by the VC3 team. IPIS training documentation tended to be quite prescriptive and assumed a degree of familiarity with NEC work practices.

The VC3 team recognised the need to invest a significant amount of time and effort in setting strategy, agreeing technology usage protocols and aligning work processes at different stages of their collaboration. Although resources were allocated to tackle the information communication technology aspects of the CNL project, strategy and work processes did not seem to receive the attention they deserved. NMC project management effort was focussed on solving the more immediate technical and contractual problems.

In their post-mortem, the VC3 team acknowledged that the support of a knowledge manager would have greatly assisted the 8-person collaboration. The CNL project which involved several hundred people would definitely have benefited from a knowledge manager employed by Enercorp to oversee this crucial aspect across all the participating organisations. Instead, the project relied on the support of NEC's corporate information systems management personnel who had developed IPIS. These personnel, whilst expert in NEC's integrated project information system, did not necessarily have the overall project knowledge management perspective or sufficient motivation to understand the culture and specific needs of the other organisations.

## **SUGGESTIONS FOR FURTHER RESEARCH**

More cases could be studied to examine the applicability of this approach to other engineering design and construction projects. This may be influenced by factors such as type of industry, project size and duration, geographical dispersion of project team, degree of overlapping work, contracting arrangements and characteristics of participating organisations. The last factor could include experience of previous collaborative work between and within the organisations, as well as evidence of the requisite skills required to design and manage virtual teams of knowledge workers from different organisations (Grenier, 1995, Chap. 20).

A more detailed consideration of the information flows involved in such complex projects may be worthwhile. Previous work on sequential, design centered, concurrent and dynamic design definition models (Yazdani, 1999) for product engineering could perhaps be extended to such one-off projects. In addition to the challenge of information management during the dynamic engineering and construction phase, there are also whole of project life economic and knowledge management issues to be considered (Jaafari, 2000).

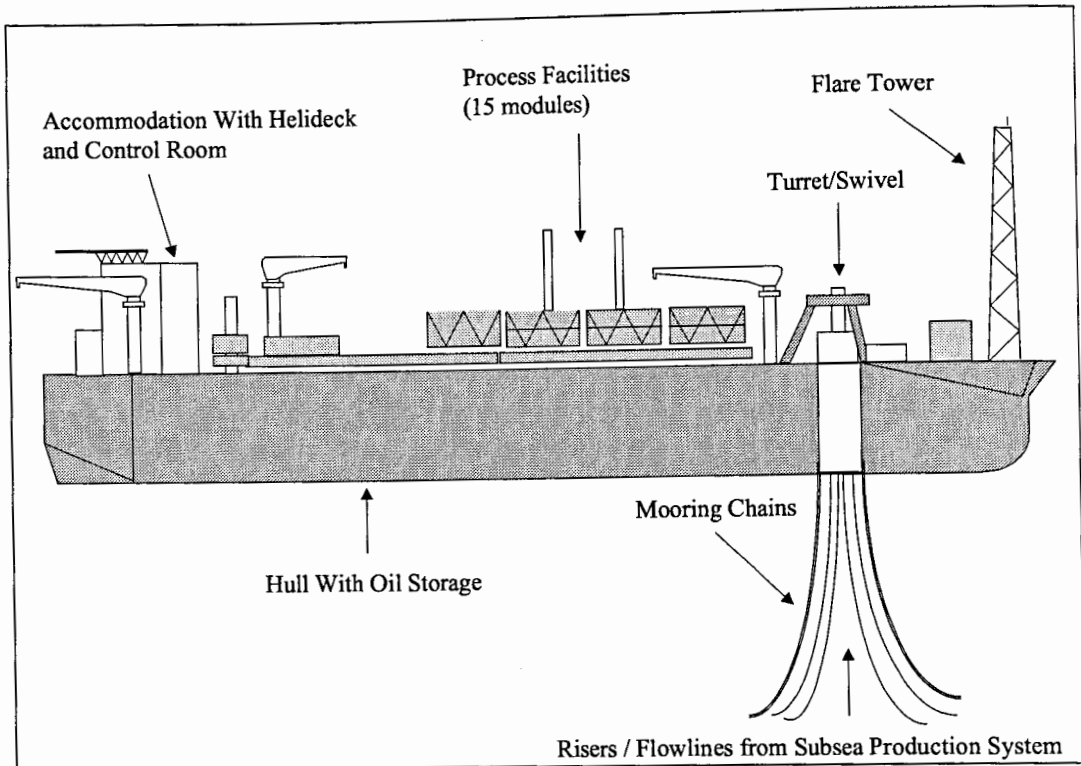
The work by McKay (2000) on the design of interorganisational tools could perhaps be extended to provide specific guidance from the infrastructure, infostructure and infoculture perspectives (as defined in Newell (1999)) for further development of this approach. Much depends on the degree of motivation at organisation, team, and personal levels to invest in setting strategy, agreeing collaborative technology usage protocols and aligning work processes (Carman, 1999) for the benefit of these one-off projects. If the network organisation (Miles, 1994) is the ideal model for such

geographically dispersed projects, is it achievable in practice in the highly competitive oil and gas environment (Rosi, 1999)?

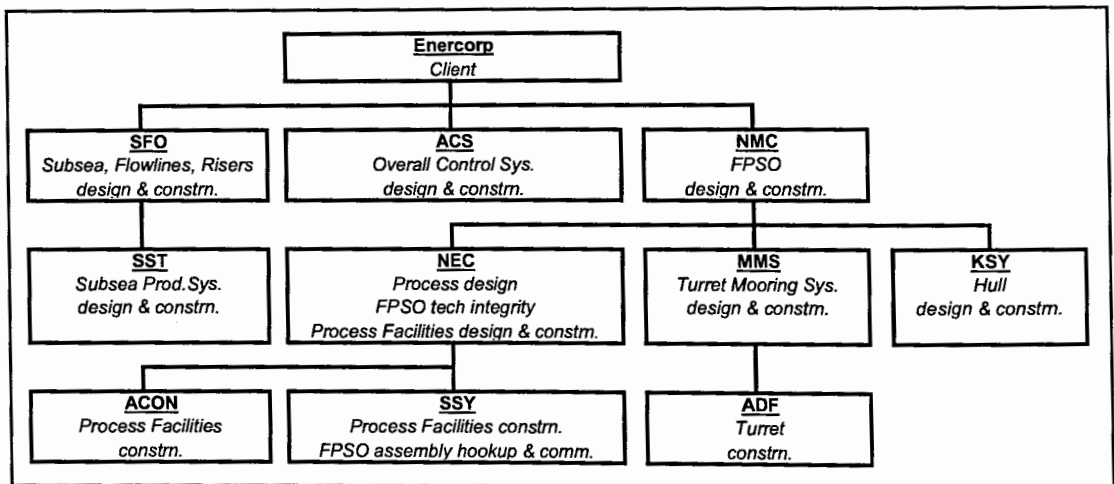
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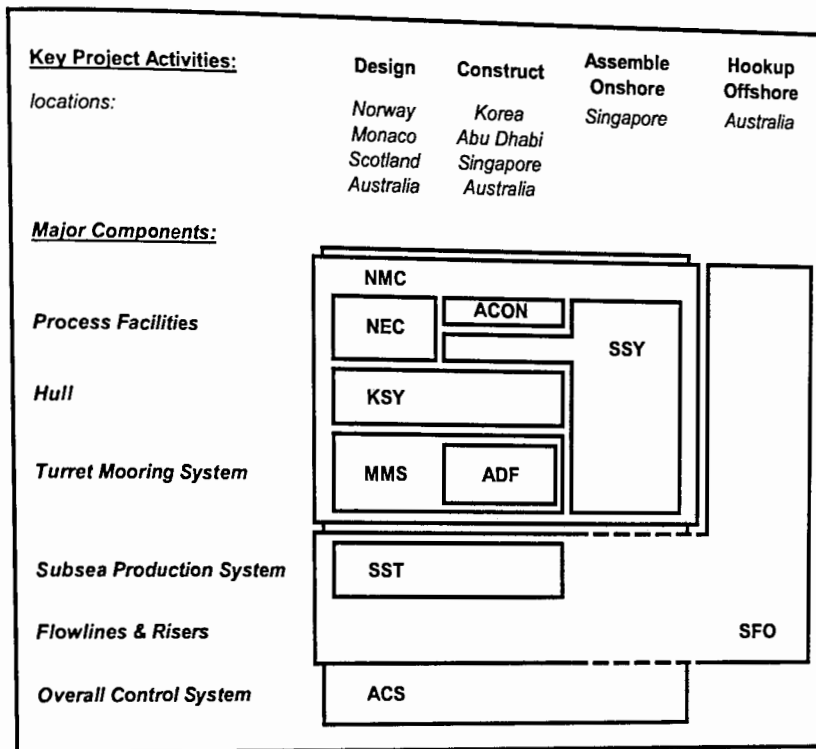




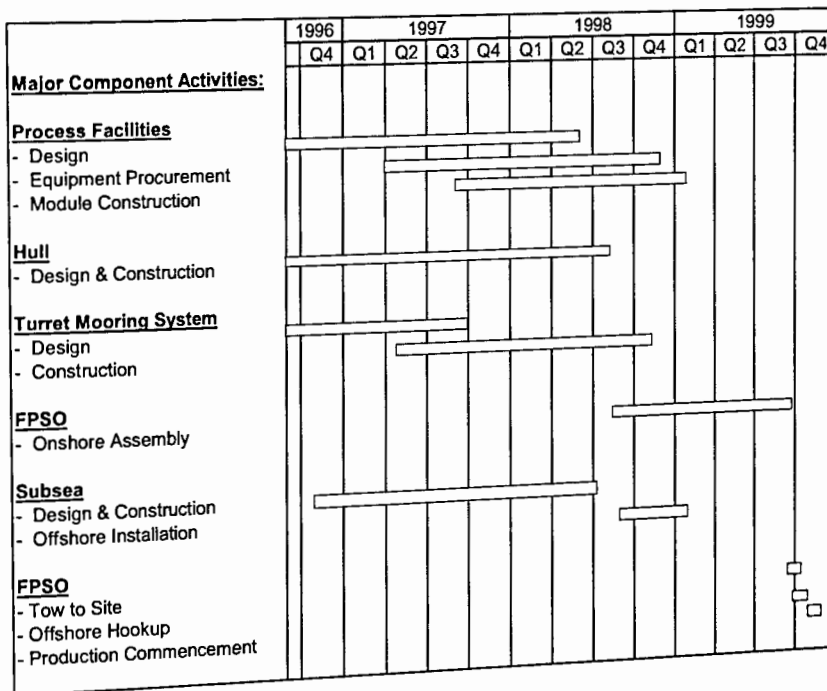
**Fig. 1 FPSO Configuration**  
(Schematic only)



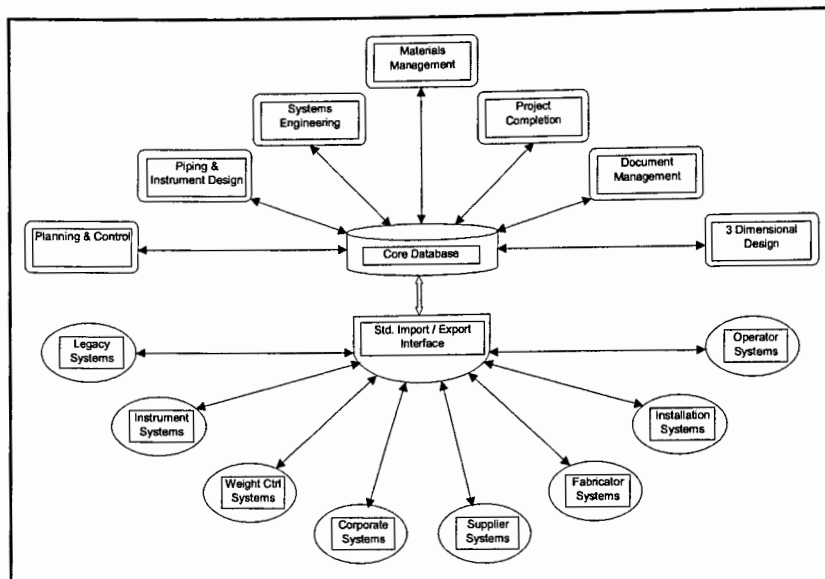
**Fig. 2 Project Contract Hierarchy**



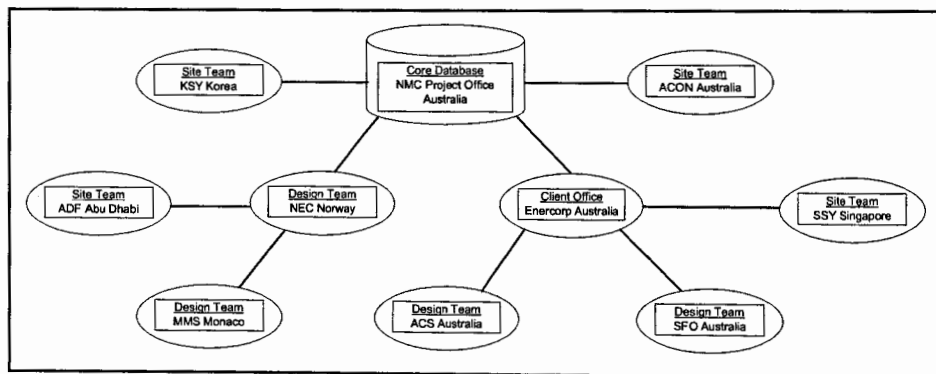
**Fig. 3 Project Contract Boundaries**  
(Schematic only)



**Fig. 4 Project Schedule**  
(Indicative only – to illustrate overlap of major component activities)



**Fig. 5 Integrated Project Information System**  
(Conceptual only)



**Fig. 6 Project Wide Area Network**  
(Schematic only)

# B2B E-Commerce and Small Businesses: A Melbourne Snapshot

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## ABSTRACT

*This paper examines some of the literature in relation to the use of Business-to-Business (B2B) electronic commerce by small businesses. A survey of businesses in the Melbourne (Australia) region was carried out to see if the issues identified in the literature in relation to the use of B2B e-commerce applied locally. Results showed Melbourne businesses to be consistent with uses and attitudes identified in the literature. Small business respondents had a lower level of document transfer, less B2B awareness and had lower levels of adoption of B2B. Some trends were identified in different industry areas.*

*Keywords: B2B; Business-to-Business; E-Commerce; Small Business; Melbourne; Australia*

## INTRODUCTION

Value wise, business-to-business (B2B) electronic commerce is the most significant form of electronic commerce activity. This paper examines some of the literature in relation to the adoption (and non-adoption) of this type of electronic commerce by small businesses. The purpose of this paper is to report on the results of a survey of small businesses in the Melbourne (Australia) region. The study examines whether many of the characteristics identified in the international literature can be applied locally, especially in the areas of small business knowledge of B2B, and the reasons for its adoption and non-adoption.

## BACKGROUND

### *Business-to-Business Electronic Commerce*

Straub (1998) defines electronic commerce (e-commerce) as activities that directly support commerce by means of electronic (that is, networked) connections. The majority of external activity currently occurs between one business and another business (dubbed business-to-business or B2B e-commerce (DIST, 1998), and often involves many businesses along the supply chain. An example of this is the supply chain of wholesaler to distributor to retailer to customer, where all of the links are B2B except the one between retailer and customer, which is business-to-consumer (or B2C). B2B e-commerce provides the ability to connect businesses with their trading partners creating new benefits and advantages in the supply chain

It is estimated that B2B transactions have comprised 80% of all electronic commerce (Conhaim, 1999). This is likely to remain the case in the near future. Some of the reasons for this include (Straub, 1998; Viehland, 1998):  
Businesses are generally more computerised and networked than homes  
Many businesses only sell their goods and services to other businesses.  
The majority of transactions in the supply chain for many businesses goes from business to business.

Supply chain management tools, involving the communication of information such as payment terms, instructions and product details electronically, dominate B2B e-commerce applications. Large retailers are able to remove a substantial part of their inventory carrying costs as purchasing becomes the most popular type of business-to-business e-commerce transaction (Friel, 1999; Conhaim, 1999). Many suppliers are now providing web sites that not only provide these services, but also extra services such as order placement and approval tailored to a particular organisation (Karpinski, 1999). Newer supply chain related B2B activities target just-in-time applications and improved customer response (Johnston, 2000).

### ***B2B Electronic Commerce In Small Business***

For the purpose of this study a small business will be characterised as one with 30 employees or less (including managers/owners).

## **ADOPTING B2B IN SMALL BUSINESS**

For more than two decades, B2B 'electronic' commerce has primarily entailed large companies building private, proprietary networks to link themselves with business partners (this being known as Electronic Data Interchange or EDI). The internet is providing a more open (less proprietary) approach to B2B e-commerce as an alternative to traditional EDI. Small businesses have been reluctant to adopt EDI as they felt that they could not justify doing business in this manner due to the large investment in software, hardware and telecommunications equipment. Due to the open nature of internet technology, small businesses now have the means to participate in business-to-business e-commerce (Johnston, 2000).

Small businesses may be forced to implement B2B e-commerce just to remain competitive within their industry. Also, pressure from trading partners can force small business owners/managers to adopt B2B e-commerce, by threatening their smaller trading partners into implementing it or risk the termination of the business partnership (MacGregor and Bunker, 2000).

## **KNOWLEDGE OF B2B E-COMMERCE**

When attempting to comply with the push toward B2B e-commerce, small businesses are faced with a typical obstacle of simply not understanding which tools can help them develop a successful solution. Although small business owners, managers and employees are much more technologically savvy today than a few years ago, small businesses mostly do not have the internal resources to successfully manage B2B technology without assistance (Johnston, 2000). As a result small business owners/managers will often seek assistance from e-commerce solution providers. However, the solution providers working with small businesses are becoming more cautious about the e-commerce market. One issue for e-commerce solution providers in the small business market is that many clients fail to pay their bills on time. Another issue for solution providers is the lack of in-house IT knowledge. As a result, e-commerce solution providers are being cautious and more selective about the small businesses they accept as clients. As such, small businesses may be restricted in their choice of solution providers (Rogers, 2000). 'Successful' use of IT in small businesses is positively related, however, to vendor service, support, training and expertise (MacGregor and Bunker, 2000), so the incentive is there for small businesses to pursue external expertise where it is needed.

Most advocates of EDI in small business have traditionally just translated the benefits available to larger businesses over to smaller businesses, without necessarily investigating the specific characteristics of smaller businesses (Macgregor and Bunker, 2000). Owners/managers of small businesses which are aware of or involved in implementing and maintaining B2B e-commerce systems therefore need to have current and thorough knowledge of such technology in order to gain optimum benefits from B2B e-commerce capabilities. A small business manager that has limited knowledge of B2B e-commerce may be reluctant to willingly implement such technological capabilities.

## REASONS FOR SMALL BUSINESSES NOT ADOPTING B2B

The previous two sections sum up the major reasons why many small businesses have not adopted B2B e-commerce: a lack of knowledge of the benefits it can provide, the cost of the technology and a lack of the skills needed to implement it.

### THE STUDY

The purpose of this study was to investigate small businesses in the Melbourne (Australia) region to see if the issues identified in the general literature in relation to the adoption and use of B2B e-commerce in small businesses applied in Australia. It also provided an opportunity for a comparison between different industries within those small businesses to see if any trends were evident.

#### *Population and Sample*

The population for this study was drawn from the Australian Melbourne Metropolitan Yellow Pages Directory – 2001 (Telstra Corporation, 2000). The aim was to obtain a sample where at least 75% of the businesses were small. This was initially determined on an ad hoc basis by the selection of only those businesses with a one-line advertisement in the directory (the idea being that mainly small businesses would take out these types of advertisements).

To compare the use of business-to-business electronic commerce throughout the various industries, a stratified random sample was used to include businesses from different industries according to the category they were listed in the directory.

### DATA COLLECTION

Data was collected via a four-section questionnaire, distributed by mail. The first section included questions on the general characteristics of the business. Section two was intended to determine respondent's knowledge of B2B e-commerce. The third section aimed to gather information on various issues targeting those businesses that use business-to-business e-commerce. The last section aimed to gather information on various issues for businesses that have not implemented B2B e-commerce.

### RESPONSE RATE

The response rate was achieved after the initial survey was sent out in October 2000 and a follow-up was mailed out in December 2000. The overall response rate was 73 of 140 companies (approximately 52%). This was considered to be a most adequate response rate.

The returned questionnaires have been classified into the following characteristics:

78% of respondents were from small businesses (1-30 employees)

11 % of respondents were from medium businesses (31-100 employees)

11% of respondents were from large businesses (101 or more employees)

This distribution meant that the desired proportion of small businesses (over 75% of the entire sample for the study) had been achieved.

The response rate may have been higher but several completed surveys were disregarded as they were returned after the return date specified on the questionnaire cover letter and survey. There were also 13 surveys that were 'returned to sender' as the businesses had left the address specified. This gave an effective response rate of 57% (73/127).

Data was analysed using Microsoft Excel.

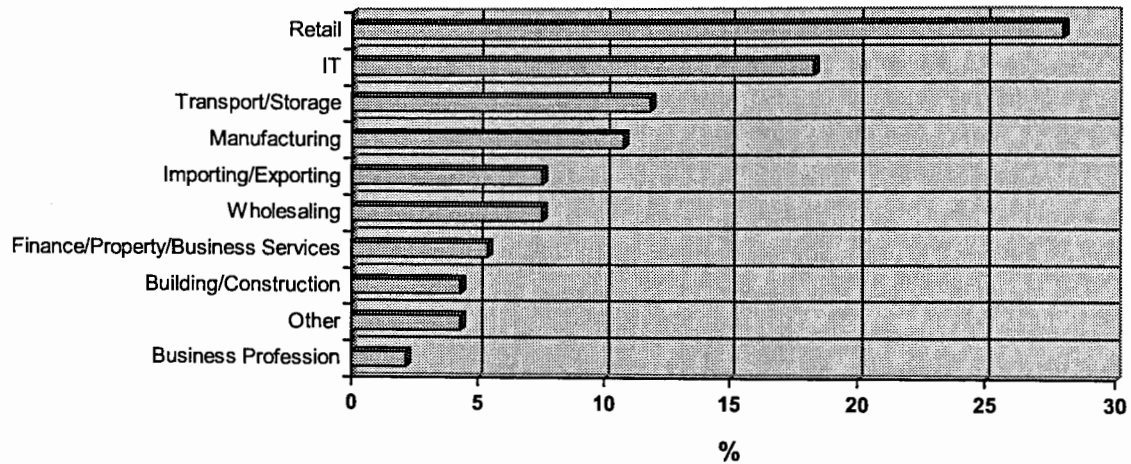
## RESULTS

### *Business Characteristics of Respondents*

#### INDUSTRY BREAKDOWN

Graph 1 shows that almost 28% of survey respondents were from the retail industry with IT respondents accounting for just over 18% and almost 12% of respondents belonging to the transport/storage industry.

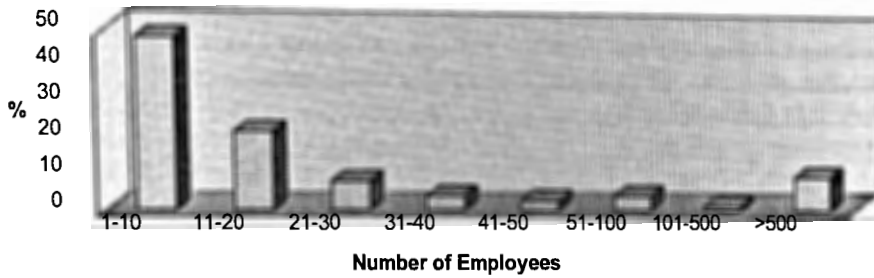
**Graph 1: Percentage of Industries Surveyed**



#### SIZE OF BUSINESS

The sample chosen for this study was primarily focused on small businesses (1-30 employees). As expected, the bulk of survey respondents fell into the small business category. Just over 78% of respondents were employed or managers/owners of a small business. Medium businesses (31-100 employees) accounted for 11% of the results with large businesses (101 or more) also accounting for 11%.

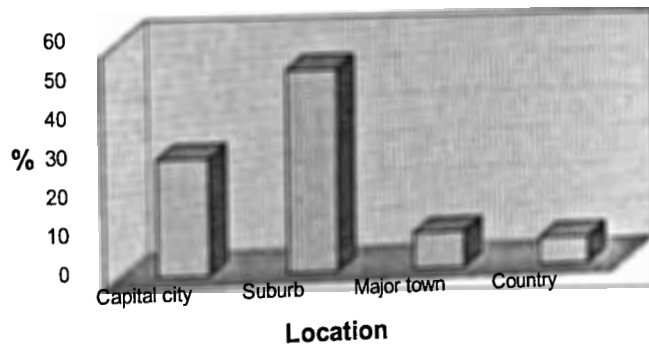
**Graph 2: Number of employees within businesses surveyed**



## GEOGRAPHICAL LOCATION

Over 80% of respondents owned business establishments in city or suburban areas of the Melbourne metropolitan region.

**Graph 3: Geographical location**

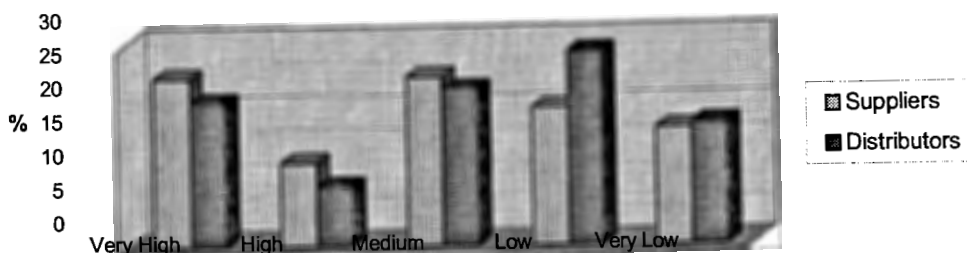




**DOCUMENT TRANSFER**

The volume of business document transfer that is required to conduct business may be an issue in the decision to implement B2B e-commerce within the organisation. Respondents were asked to rate their volume of business document transfer using a scale ranging from very high to very low. Upon devising this scale it was considered that what one respondent estimated very high to be might be conflicting with another respondent's estimation. To overcome this, a number (of business documents) was assigned to each level of the scale.

**Graph 4: Volume of business documentation transfer**



Although Graph 4 implies a relatively even spread of document transfer across respondents, medium to large company respondents indicated that they have medium to very high levels of business documentation transfer between their suppliers and distributors, whereas the majority of small businesses rated their transfer of business documents between very low and medium.

Small businesses in the retail industry indicated a low to medium volume of document transfer. Transport and storage small business owners indicated a low rate of document transfer with any suppliers and distributors, whereas information technology small businesses tend to have very high document transfer between suppliers and low document transfer rates with distributors. This indicates that business document transfer is not consistent across different industry supply chains. This is likely to affect the level of adoption of B2B e-commerce across different industries.

**B2B ADOPTION RATES**

The following tables show the B2B e-commerce adoption rates amongst small business respondents.

Table 1: B2B E-Commerce Adoption in the Retail industry

	Yes	No
Small business	50%	50%
Medium-large business	80%	20%

Table 2: B2B E-Commerce Adoption in the Transport & Storage industry

	Yes	No
Small business	25%	75%
Medium-large business	80%	20%

Table 3: B2B E-Commerce Adoption in the Information Technology industry

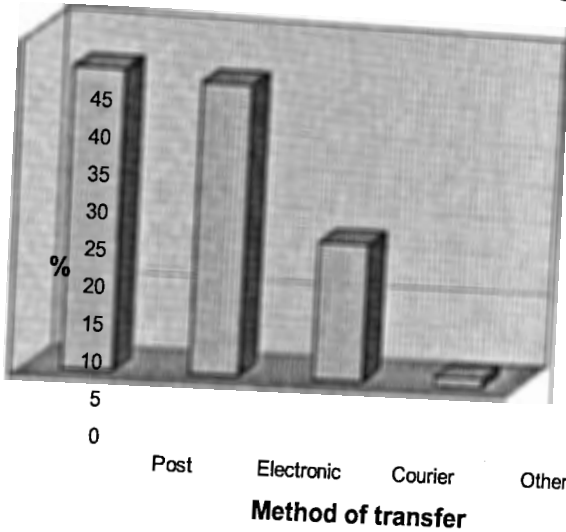
	Yes	No
Small business	77%	23%
Medium-large business	75%	25%

This result is consistent with that of the previous question. It was also expected that adoption rates would be generally higher in medium to larger businesses than in small businesses. The information technology industry provides an interesting contrast to this.

## METHOD OF DOCUMENT TRANSFER

Almost 40% of survey respondents indicated that they use postal services more than any other method of document transfer. Thirty nine percent also stated they use electronic means of document transfer. Electronic transfer was specified as facsimile, electronic mail or the Internet. Courier use is less favourable in small businesses due to the higher cost. All medium to large business respondents stated they use postal service with 56% also indicating they utilise couriers for business documents transfer between trading partners.

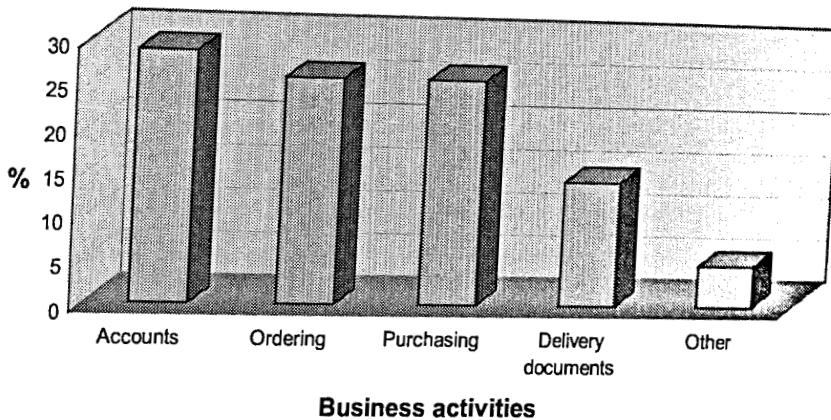
Graph 5: Method of document transfer



## USES OF B2B E-COMMERCE

Graph 6: Business activities using B2B E-commerce

Over twenty eight percent of businesses that have implemented B2B e-commerce use such technology for



accounts payable and receivable to and from trading partners (namely suppliers and distributors) and other businesses associated with the company. Almost twenty six percent of businesses indicated they use B2B e-commerce for ordering and purchasing with only a further fourteen percent stating they use it for delivery documents of goods or services provided by the business. Businesses that have implemented B2B e-commerce also stated other business activities it is used for:

- Tracking
- Information gathering
- Business documents
- Selling
- Acquire system support files, software applications and upgrades

Businesses in the manufacturing industry indicated they mostly use B2B e-commerce for ordering goods and services and for accounts payable and receivable. Wholesaling businesses typically use the technology for ordering and the purchase of goods and/or services from other businesses. Businesses in the retail and

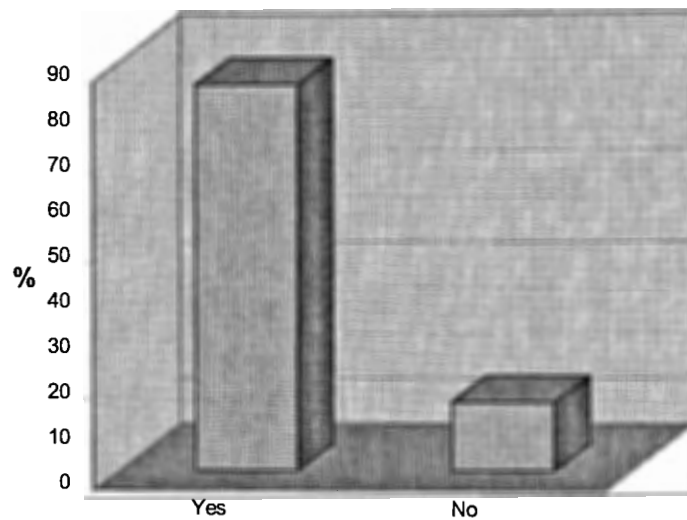
information technology industry both indicated they mainly use B2B e-commerce for such business activities as ordering, purchasing and accounts payable and receivable. Transport and storage businesses surveyed stated they generally use the technology for purchasing goods/services and accounts payable/receivable.

*Knowledge of Business-to-Business E-Commerce*

**AWARENESS OF B2B E-COMMERCE**

It can be seen from Graph 7 that almost all businesses surveyed are aware of business-to-business electronic commerce. Eighty five percent of the entire population are aware of such technology compared to only 15% of respondents that are completely unaware of B2B e-commerce. The respondents that answered 'no' to this question were business owners/managers from small businesses. Therefore, over eighty percent of small business respondents were aware that B2B e-commerce exists. All the business managers surveyed from medium to large organisations indicated they are fully aware of this technology.

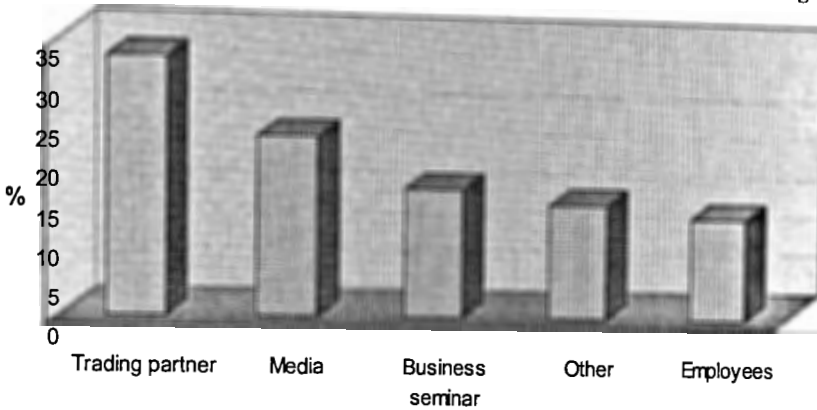
**Graph 7: Awareness of B2B E-commerce**



## FINDING OUT ABOUT B2B E-COMMERCE

As mentioned earlier, small businesses run the risk of losing trading partners and revenue if they do not establish B2B electronic commerce facilities to be 'in sync' with the businesses trading partners. Business managers/owners initial hearing about B2B e-commerce from the businesses' trading partners accounts for over thirty two percent of the survey population. Nearly 23% of respondents that have implemented B2B e-commerce indicated they heard of such technology through the media.

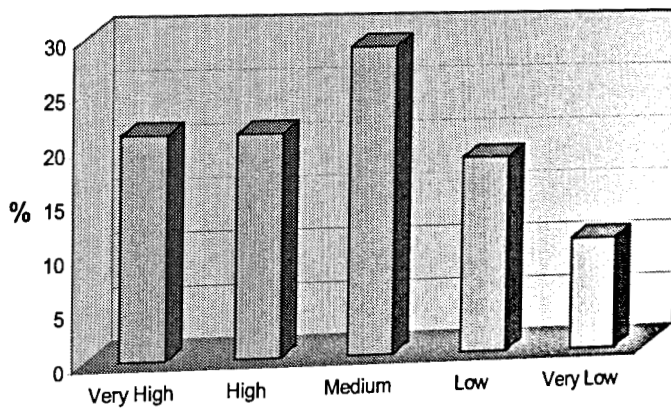
Graph 8: Source of Initial knowledge of B2B E-commerce



## SELF-RATED KNOWLEDGE OF B2B E-COMMERCE

The level of knowledge owners and managers have of B2B e-commerce can determine the future and success of its implementation within the business. B2B e-commerce knowledge of owners and business managers was measured by a rating scale for those businesses that have implemented the technology, with the results presented in Graph 9. The results indicate that nearly thirty percent of respondent business managers rate their knowledge of B2B e-commerce as medium or intermediate.

Graph 9: Rated B2B E-commerce knowledge



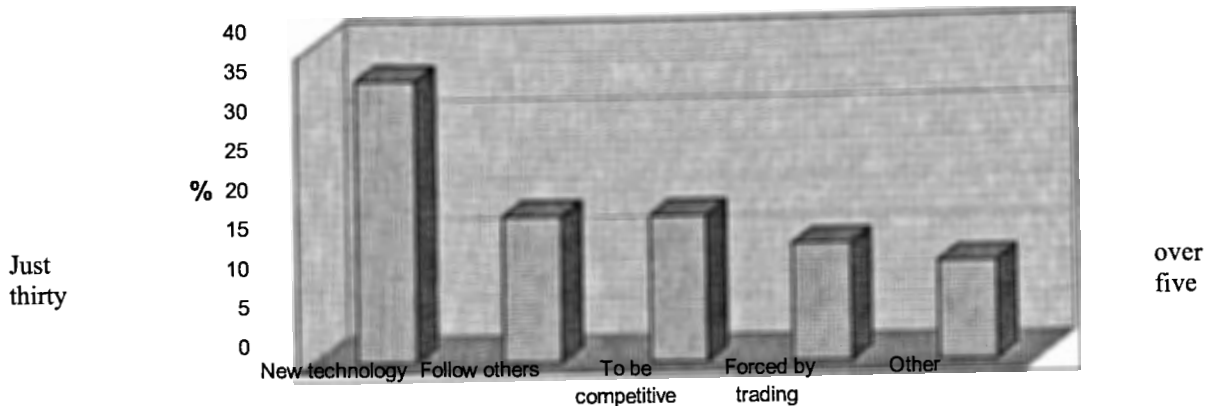
It appears that managers of medium to large businesses are more likely to have a higher degree of B2B e-commerce knowledge than those owners/managers in small businesses. Some 91% of medium to large business managers indicated they possess a medium or higher level of B2B e-commerce knowledge, compared to only 60% of small business managers indicating B2B knowledge at the same levels.

It is interesting to analyse the retail, information technology, and transport and storage industry and compare the rated knowledge of the businesses in these industries. It is important to note that this comparison among industries include small, medium and large businesses. The results imply that business managers/owners in the retail industry generally rate their B2B e-commerce between low and very low. Having a better understanding than other managers in other industries, information technology industry respondents rated their knowledge

between high and very high (or experts). Finally, all the transport and storage industry businesses surveyed rated their business-to-business e-commerce knowledge as medium.

**Reasons for Adopting E-Commerce**

**Graph 10: Reasons for adopting B2B E-commerce**



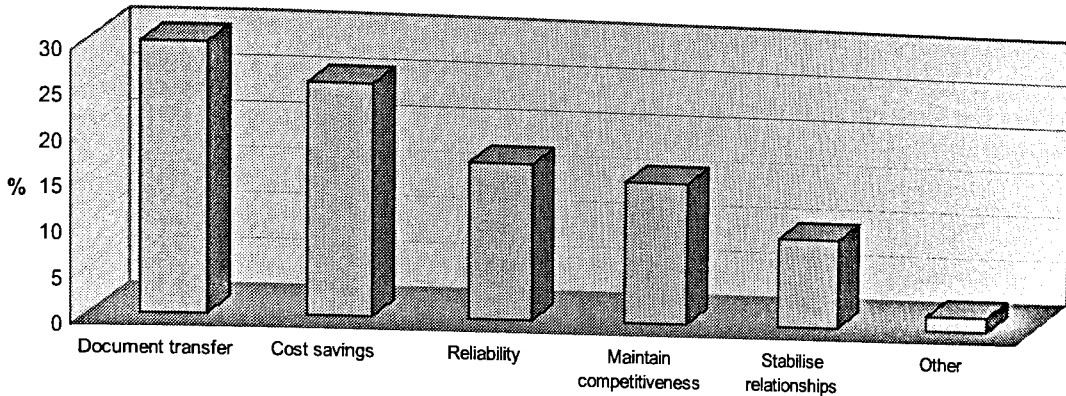
percent of all respondents that have implemented B2B e-commerce stated the reason that their business adopted it was to take advantage of new technology. It appears that these businesses wanted to 'dip their toe into the water' and see why so many business experts believe B2B e-commerce is one the best business revolutions that has occurred to date. Respondents indicated that other reasons for adopting B2B e-commerce include:

- Convenience
- Speed of document transfer
- Cost savings
- More time efficient
- Increased productivity
- To follow the IT standards
- Improve bottom line
- Reduce bank fees
- Ease of overseas contact

Only ten percent of small businesses stated they were forced by trading partners to implement B2B e-commerce compared to twenty two percent of medium to large businesses that were forced by the businesses' influential trading partners (fifteen percent overall). Twenty percent of small businesses and sixteen percent of medium to large businesses revealed they adopted B2B e-commerce in order to keep ahead of the competition. Similarly, twenty percent of small businesses and sixteen percent of medium to large businesses indicated they implemented B2B e-commerce to follow suit of other businesses adopting the same technology.

## Benefits of B2B E-Commerce

Graph 11: Benefits gained from B2B E-commerce implementation



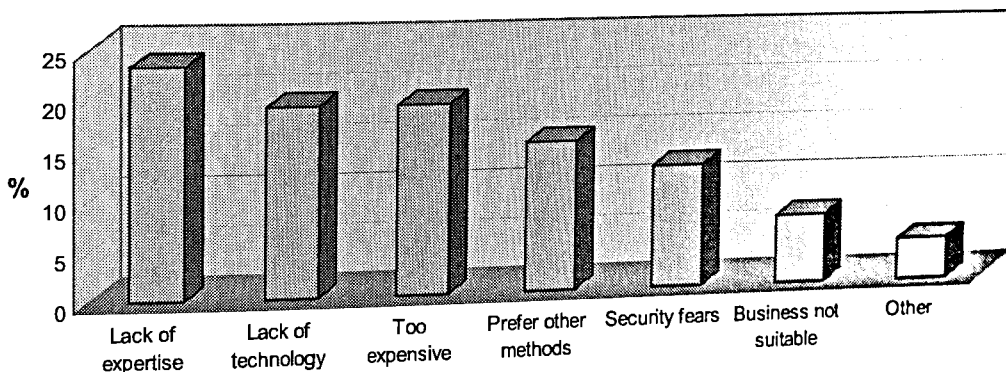
Almost thirty percent of all respondents stated the ease of document transfer is considered to be the most significant benefit gained from B2B e-commerce implementation within the business environment. Another significant benefit indicated by respondents, twenty five percent, was the cost savings that resulted from the implementation of the technology. Respondents were encouraged to choose more than one benefit if applicable. Eighty percent of small business respondents and eighty five percent of medium to large businesses acknowledged cost savings occurred within the businesses after B2B e-commerce implementation. These results were as expected and consistent with the literature.

## Reasons for Not Implementing B2B E-Commerce

There are a number of reasons why businesses may be reluctant to implement B2B e-commerce within the organisation. These reasons range from too expensive to security even lack of technical expertise within the business. Graph 12 summarises the results from this question. Twenty three percent of respondents that have not implemented B2B e-commerce revealed that they have not done so as there is a lack of e-commerce knowledge and/or technical expertise within the business. Another nineteen percent of businesses indicated that B2B e-commerce is too expensive to implement and they lack the computer technology within the business.

In comparison, none of the medium to large businesses surveyed indicated they have not implemented B2B e-commerce due to it being too expensive, business not suitable for the technology or preferring face-to-face/other traditional means of communication including telephone, fax, post and so on.

Graph 12: Reasons for not implementing B2B E-commerce



## FUTURE STUDIES

Overall, many of the general results reported in this paper are consistent with the literature. Some interesting trends, however, were identified in different industry areas. Small businesses in the information technology industry indicated a high level of expertise, a high level of business document transfer and, thus, a high level of B2B e-commerce adoption. These indicators were not as strong for the retail and transport and storage industries. It will be interesting to further pursue the drivers to this relationship. For instance, is the knowledge of B2B benefits the major driver for its adoption, or the high level of business document transfer? Could it even be possible that the existence of B2B e-commerce in the industry causes a higher rate business document transfer?

## CONCLUSION

Results of this study of small business use and attitudes to B2B e-commerce in the Melbourne region have proven to be reasonably consistent with uses and attitudes identified in the literature. Small business respondents had a lower level of business document transfer, lesser awareness of B2B e-commerce and generally rated their own B2B e-commerce knowledge lower than their medium to large counterparts. All of this leads to lower levels of adoption of B2B e-commerce. Of those businesses that have adopted B2B e-commerce, only 15% were forced to by a trading partner. The major benefits gained from its adoption were, not surprisingly, ease of document transfer and cost savings.

Reasons for the non-use of B2B e-commerce were also consistent with those identified in the literature, relating mainly to a lack of knowledge and technical expertise and the cost of the technology.

Some interesting trends were identified in different industry areas. As perhaps could be expected, small businesses in the information technology industry indicated high levels of expertise and business document transfer, and thus a high level of B2B e-commerce adoption. These indicators were not as strong for the other industries.

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