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eBusiness Transformation Matrix

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Abstract

A model of e-business transformation is developed for ERP enabled organisations, based on the findings of a longitudinal multiple case study. The model is represented as a matrix along three stages of e-business growth. The theory embedded within the matrix recommends that successful ebusiness transformation with ERP occurs when; B2B value propositions are realised through integration and differentiation of technologies, used to support new business models for delivering products and services online. In addition, the management focus evolves through self-service, and empowerment towards extensive relationship building.

1. Introduction

This paper presents the consolidated results from a longitudinal study into e-business implementations through ERP (e-ERP). The study consisted of three separate stages, each employing a different research model to investigate three research questions:

- Q.1: How do organisations maximise benefits from e-ERP implementations?
- Q.2: What factors facilitate and/or inhibit success of e-ERP implementations?
- Q.3: Is there a particular pattern of business transformation for successful e-ERP implementations?

We bring together the antecedents of e-business success using the findings from case analyses against three separate research models: B2B interaction, e-business change, and virtual organising. A single model of e-business transformation (eBT) is proposed that focuses on realising the benefits of B2B interaction, from virtual organising by utilising the facilitators of successful e-business change. This model of eBT represents a comprehensive view of e-ERP as the fusion of the three research models, mapped into various stages of e-business development; integration, differentiation, and demonstration of value propositions. The authors argue that successful e-business transformation with ERP occurs when *value propositions* are realised through *integration* and *differentiation*, of *technologies* used to support new *business models* to deliver *products and services*

online. The associated management issues evolve through self-service, care and empowerment towards extensive relationship building with multiple alliances.

2. Theoretical Framework: Triangulation of Research Models

A comprehensive model of e-ERP implementations may be presented simply, as the fusion of three interrelated models. Figure 1 illustrates e-ERP as a primitive composite view of the three research models.

Benefits of B2B, e-Business Change, and, Virtual Organising where:

- Benefits of B2B is illustrated by a two dimensional model (1) where value returns are directly proportional to the level of integration of e-business activity across a set of B2B models (Carlson, 1995). B2B refers to the class of business-to-business (B2B) models that include business-to-supplier (B2B^S), business-to-employee (B2E), business to consumer B2C and business-to-corporate customer (B2B^C), (Ash, 2001).
- e-Business Change is illustrated by a flat model (2), in which progress is across eleven interrelated components within three broad dimensions based on relevant research in the areas of “organisational change, strategic management innovation, and e-business evaluation” (Guha et al, 1997).
- Virtual Organising is illustrated by a three-dimensional model (3) of e-business activity, that is “applicable to any company.” Progress is along the three dimensions of “customer interaction, asset configuration, and leveraging knowledge” (Venkatraman & Henderson, 1998).

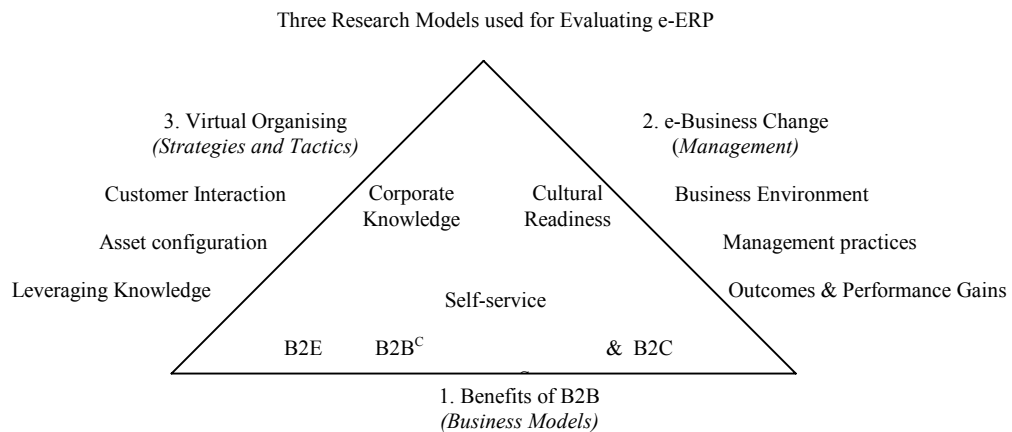


Figure 1: Three Faces of e-ERP Implementation

Each model reflects a different business focus covering organisational theory, strategy, change management, and work practices. These models were evaluated at different stages in the study through a composite case based approach as shown in Figure 2.

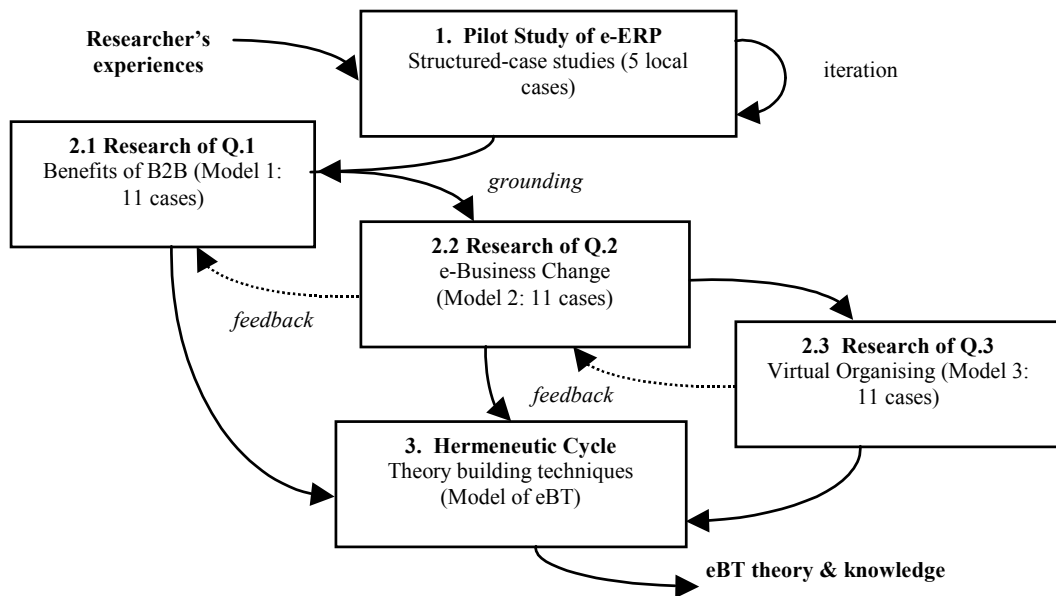


Figure 2: Composite Case-based Research Method

A pilot case study of 5 Australian SAP sites helped ground the theory of the study for Q.1. This was followed by a three-stage study of eleven international cases within a diverse industry context. The final conceptual framework is described in terms of e-business transformation (eBT). The concept of eBT is defined as realising the benefits from virtual organising within complex B2B interactions by utilising the facilitators of successful e-business change.

Data Collection and Analysis

Data was gathered from three sources; primary, secondary and tertiary:

- Primary data – from semi-structured interviews conducted November 1999, June 2000, and June 2001 in eleven international organisations.
- Secondary data – from company documents collected or sent via emails.
- Tertiary data – from case research papers written by third party specialists.

In all cases the focal point for contact was a senior-project manager in the company who was directly responsible or integrally involved with the project from beginning to end. To eliminate any bias by a single respondent, attempts were made to ensure triangulation of data from multiple sources in the organisation. Most of the interviewees were either sponsors of the e-ERP or major team members who had a good, objective, and knowledgeable view of the project. The questions and collection instruments are summarised in Table 1.

Table 1: Data Collection and Analysis Matrix

Questions #	Data Collection Instrument	Data Analysis
1. How do organisations maximise benefits from e-ERP implementations?	1 st Interview instrument - semi-structured Questionnaire.	Content analysis of interview data within CF ₁ model developed from the Pilot Study.
2. What factors facilitate and/or inhibit the success of e-ERP implementations?	2 nd Interview instrument - semi-structured Questionnaire constructs of components of e-ERP projects.	Cross-case analysis of constructs to determine the components that contribute to success or failure; using exemplar cases.
3. Do e-ERP projects fit the strategy of virtual organising?	1 st and 3 rd Interview instrument - semi-structured Questionnaire and industry presentations.	Map content of all cases to demonstrate the vector interdependence maximum benefits from VOing

Table 2 summarise the profiles of the case organisations that participated in the study. The findings are presented by the categories of the three interactive business models summarised as:

Table 2: Business-to-Business Cases

Case Organisation	Industry	B2E Interaction	e-Business Project Title	No. of Users
1. Halliburton	Engineering	Intranet access to	“Employee Tracking Intranet”	~1100 staff
2. UBS	Banking	ERP	“Employee Networking”	~40,000 emps
		B2C Interaction		
3. Wine Society	Retailing	Internet access to ERP	Online Ordering by Members	~60 staff
4. UNICEF Aust.	National Charity	Internet access to ERP by ASP	1 st Australian Charity Web site	~35 employees +30 volunteers
		B2B Interaction	(B2B ^S and B2B ^C)	
5. Biotech	Biotechnology	ERP to supplier catalogues and	Staff research procurement	~240 staff
6. Novartis	Chemical		Sales Order and Rapid Delivery	~22,000
7. Bertelsmann	Media	Intranet access	Simple Ordering e-catalogue	~28,000
8. Statoil	Oil and Gas	to ERP data	Staff travel procurement	~18,000
9. Employee-Nat	Employment		Simple Ordering e-catalogue	~14,000
10. FSC - Fujitsu Siemens computer	Computer	ERP to corporate customers	Order Request System extended to an e-Mall of 3 companies	~11,000
11. Dell corp with LSI Logic corp	Computer ----- - Electronics	non-ERP with ERP	Customised online sales Integrated with customers MRO procurement	~27,000 ~14,000

- Business-to-employee (B2E) to harness the flow/sharing of corporate information, via intranets.
- Business-to-consumer (B2C) to access a 24x7 global consumer base, via the Web.
- Business-to-Business (B2B^S and B2B^C) to support supply chain management between partner organisations.

Within each classification the case findings are presented in order of increasing e-business application sophistication.

The case material collected was used to verify all the strategic characteristics of e-business transformation and to develop the eBT model. This can be used as a strategy and organisational management guide for managers throughout different stages of e-business implementation.

3. Model of eBusiness Transformation

To develop a precisely defined theory of eBT, we begin by identifying the basic research themes, displayed as a model in Figure 3.

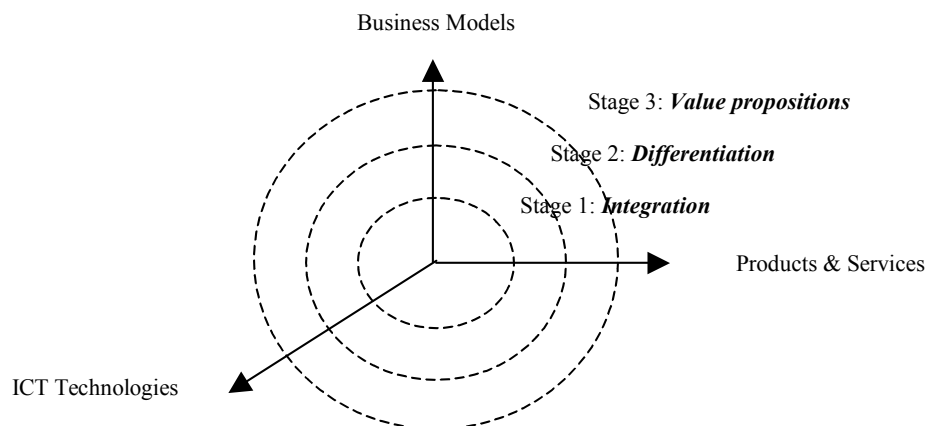


Figure 3: e-Business Transformation Model

Figure 3 illustrates eBT as a comprehensive business architecture that focuses on three interdependent dimensions of online business; *ICT technologies*, *Products and Services*, *Business Models* where:

- *ICT Technologies* - refers to the convergence of technologies for information flow within and between organisations, e.g. e-ERP implementations;
- *Products and Services* - refers to asset and competency sourcing for providing cheaper, faster, and improved quality of products and services;
- *Business Models* – refers to the architecture of the firm and its network of partners for creating, marketing and delivering value.

Stages of eBusiness Transformation

Each dimension of the eBT model is further detailed at three stages of greater e-business commitment to integration, differentiation, and demonstration of value propositions. Progress in the first stage focuses on *integration* for achieving efficiency gains in task units such as, customer service, purchasing, and new product development. The second stage focuses on *differentiation* by selecting the most effective resourcing and marketing activities. The third stage focuses on demonstration of *value propositions* within an inter-organisational network to design and leverage multiple interdependent communities to create superior economic value (Singh and Thomson, 2002; Venkatraman & Henderson, 1998). Figure 4 illustrates the interrelatedness of the three stages of eBT as:

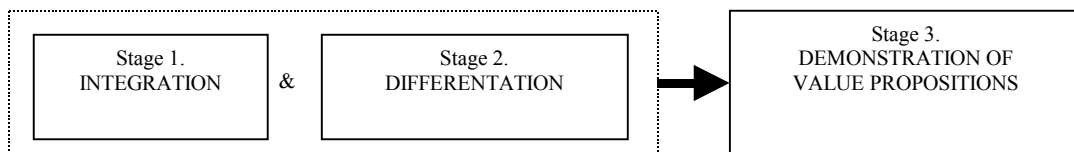


Figure 4: Three Stages of e-Business Transformation

4. eBusiness Transformation Matrix

Table 3 represents a map of the issues distilled from the findings of this longitudinal three-stage study. It is used to demonstrate the interdependence of the dimensions of e-business architecture and the stages of progression. The results of the analysis can be mapped along the e-business stages of growth as; integration of e-business technologies for e-mails and B2B commerce, differentiation of products and services for e-business positioning, and the realisation of value propositions of the e-partnerships.

Table 3: Matrix of e-Business Transformation for ERP-based Organisations

Business Dimensions	Stages of e-Business Transformation		
	(1999 -)	(2000 -)	(2001 -)
	Stage 1: Integration	Stage 2: Differentiation	Stage 3: Demonstration of Value Propositions
Technology (virtual infrastructure)	* <u>ICT</u> ERP with e-Sales & e-Procurement applns.	Differential Resourcing ASP vs cost of ownership on the outsourcing spectrum	Innovative Technologies ERP and non-ERP networks for e-marketplaces
Products & Services (virtual experience)	<u>e-Malls</u> e-Mall integration and information exchange	* <u>e-Branding</u> Customisation vs standardisation, Brand identity & integrity	<u>e-Communities</u> Foster customer, supplier, and employee expertise. Emerging collaborative online communities
Business Models (virtual B2B interactions)	<u>e-Commerce Integration</u> B2B Integration of e-Sales & e-Procurement systems B2B ^C + B2B ^S	<u>e-Positioning</u> B2B positioning within a range open to private e-marketplaces	* <u>e-Enterprise</u> One2Many vs One2One Distinct focus of One2One partnerships
Examples	Remote experience of e-catalogues. More tasks, “group ware” skills for online communication.	Assemble and coordinate assets; through effective use of online services	Business network to design and leverage interdependent e-communities. Dependent on relationships
Table 3b:	Stages of Management Practice in e-Business Transformation		
Management focus	Self-service	Empowerment	Relationship building
Outcomes and Performance Gains	Improved operating efficiency (ROI)	Effective resourcing (QWL)	Virtual and economic value added (EVA)

Key: Return on investment (ROI), Quality of working life (QWL), Economic value added (EVA)

* The diagonal cells(shaded) represent the essential elements of eBT

Essential Elements of eBusiness Transformation

The model of eBT shows business focused at three stages of development with outcomes and performance gains of greater virtual progression:

Stage 1 – Integration of technologies is essential for cost reductions and operating efficiencies;

Stage 2 – Differentiation of products and services is essential for e-business market positioning through effective resourcing.

Stage 3 – Demonstration of value propositions within B2B interactions is essential for superior economic and virtual value.

In Table 3, the shaded cells in the 3x3 matrix indicate the essential elements of eBT. The other elements contribute to the organisation's competitive advantage. The performance gains are centred on improving operating efficiency, effective use of desktop self-service applications by employees, and the realisation of complementary value adding with B2B interaction.

The management focus is on the exploitation of self-service, the empowerment of individuals, and the extensive relationship building with multiple alliances - suppliers and corporate customers. This exists within a culture of e-business readiness of the organisation and partners.

5. Case Analysis for eBusiness Transformation Matrix

Stage 1: Integration

Technologies: e-ERP (essential to stage 1)

The findings show that 'back-end' to 'front-end' enterprise application integration is essential to achieve savings and cost reduction. Integration of the system architecture is made possible through a variety of 'back-end', 'sell-side' and 'buy-side' systems; all 11 cases demonstrated this, but specifically Statoil and Siemens with their standardised ERP platform and e-business applications.

Products and services: e-Malls

In a study of Australian e-Malls, Singh and Thompson (2002) concluded, "it is apparent that for effective B2B exchange in Australia, standards for interoperability between business partners, and technology integration for information exchange on goods and services is essential", e.g. Fujitsu Siemens Computers (FSC). achieved integration of three group's online sales systems.

Business Models: e-Commerce B2B Integration

The integration of e-business models, B2B^C with B2B^S is essential to maximise efficiency gains, from supporting technology infrastructure, so that people can get the job done efficiently. Two cases of B2B e-business integration with a global computer supplier and its largest corporate customer demonstrate a more complex model. These exemplar cases demonstrate the integration of ERP and non-ERP systems with other ERP systems, using Web-based technologies, to provide the infrastructure required to optimise the overall B2B value chain. Also, the study emphasises the synergistic benefit stream from B2B integration and the interaction of inter-organisation e-business solutions; e.g. Dell and FSC.

Stage 2: Differentiation

Technologies: Differential Outsourcing

Segev and Gebauer (2001: 249) argue "the mid points of the outsourcing continuum are the most challenging". From case observations they describe the continuum as a wide range from "do it yourself" to complete outsourcing, with an increasing number of

possibilities. The one case study where the complete management of an e-ERP project was outsourced to an ASP, demonstrates the challenge for UNICEF to balance the loss of control against the cost of ownership where as FSC partially outsourced their online sales systems to Siemens Business Systems quite successfully.

Products and services: e-Branding (essential to stage 2)

The e-business tactics for positioning in the virtual space were to:

- differentiate between corporate customers and end consumers; e.g. UNICEF and Dell,
- deliver customised products and services using standard components; e.g. Dell and FSC,
- differentiate between brand identity and brand integrity, where “e-branding becomes a critical issue” (Venkatraman and Henderson, 1998: 34); e.g. Bertlesmann, UNICEF, Wine Society, Dell and FSC.

Business Models: e-Positioning

Biotech and Novartis repositioned with largest corporate suppliers. FSC repositioned itself into the computer industry through e-sales. The tendency of these pioneers was to start with development of public relationship building then shift to private relationship building between suppliers and buyers. This is observed to be more than a passing phase. Further, had the product lines been high technology-based, e.g. Dell and FSC, then it is likely the level of e-business readiness would have been too low to realise and sustain a value proposition.

Stage 3: Demonstration of Value Propositions

Technologies: Innovative Technologies

Halliburton’s HR Intranet ERP system demonstrated a B2E value proposition. Their technology innovation was bottom-up driven and from both sides B2E and B2G of the value chain. This bottom-up approach provided a model for the company’s global e-ERP infrastructure.

Employee-nat demonstrated the integration of ERP and non-ERP systems with Web technologies (Fan et al, 2000). Wine Society found problems with a lack internal expertise with implementing Web-based innovative technologies with their ERP system.

Products and Services: e-Communities

Statoil and UBS used Intranet employee self-service applications to develop a practice of industry-based e-communities. Dell has competence centres where customers can validate system design and configuration without disrupting their live computing network. These facilities act as collaborative online network to provide customers with systems design and application tuning support and allow them to test various hardware and software configurations before making a purchase decision; e.g. Dell and FSC.

Business Models: e-Enterprise Model (essential to stage 3)

A pilot approach to demonstrating a value proposition is shown in the One2One relationship formed by Dell and LSI. Also, the case emphasises the synergistic benefit stream from B2B integration, the interaction of inter-organisation e-business solutions. In the short term it may be better to adopt e-commerce implementations (e-sales and e-procurement) with new customers and suppliers. This has the capability of persuading existing customers and suppliers that are more resistant to e-business change of the win-

win value propositions; e.g. FSC with SAP, Dell and LSI. In these two ‘twin’ case studies the focus was on building a One2One relationship. The creation of a ‘win-win’ value proposition was observed to be a model for other B2B partnering models.

Although the research findings are presented in a time frame, the eBT model should be applied as a journey not a life cycle, in which progress in the three interrelated dimensions; *integration* tempered by *differentiation*, for realising B2B *value propositions*. The related management activities progress through the exploitation of self-service, the empowerment of employees, and the e-readiness of business partners necessary for accommodating emergent change.

6. Management in eBusiness Transformation

The conceptual model in Figure 5 brings together key management issues and their relationships of this study into e-business transformation. This model illustrates how change in industry practices and e-ERP developments relate to B2E, B2C and the B2B^S, B2B^C models. It identifies that there is an accelerated symbiotic relationship between e-business technologies and business improvement caused by a shift in customer demand. The arrows connecting customers, employees, suppliers indicate the business interactions through self-service, care and empowerment towards extensive relationship building with multiple alliances.

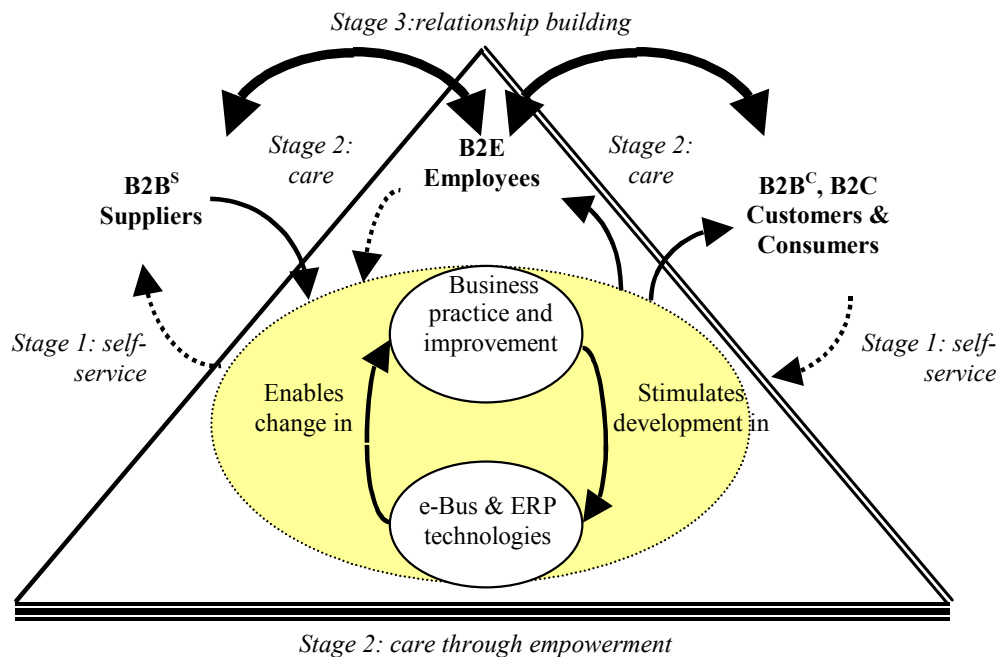


Figure 5: Relationships Building Cycle Model from Staged Growth of e-Business

To realise the benefits from the symbiosis of e-ERP developments and business practice, organisations are optimising B2B models:

- Stage 1 - To offer cheaper products with efficient service by utilising customer **self-service** in B2B^C, and consumer **self-service** in B2C, and to procure standard

materials faster through e-procurement agreements by utilising employee **self-service** in B2B^S.

Stage 2 - To provide customised service in B2B^C, by utilising employee and supplier **empowerment** in B2E and B2B^S.

Stage 3 - To generate value enhanced **alliances** through B2E, B2B^C and B2B^S, with all players in an e-ERP network.

In addition, Figure 5 represents a complete view of the foundations of this study; e-ERP technology, e-business practice, and multiple relationships building. One indicator of a successful comprehensive e-business implementation is the wide spread acceptance by employees of using B2B e-procurement for their own office equipment and supplies.

7. Outcomes and Performance Gains in eBT

The stages of eBT classified in Table 3, are viewed as interdependent and supportive of each other as in Figure 4. This is especially so with respect to the *business focus* and the *performances objectives* where *efficiency* through employee self-service and *effectiveness* through empowerment in customer care is used to support *value adding* activities for sustained competitive advantage.

To achieve the outcomes from e-ERP projects, organisations are utilising three B2B models. They offer customers cheaper products with efficient service by exploiting self-service in B2B^C and B2C. They source materials cheaper and more efficiently through procurement agreements in B2B^S and utilising employee self-service, in B2E. They now optimise processes in B2B^S with B2B^C for customised service by utilising employee self-service in B2E.

Outcomes and Performance Objectives

The eBT matrix classifies the generic outcomes and performance objectives as;

- improved efficiency in decrease order times, automatic approvals to reduce costs,
- greater effectiveness means improved decision making, greater responsibilities,
- value adding refers to complementary benefits realised for all network partners, along the value chains, when doing business online (Figure 6).

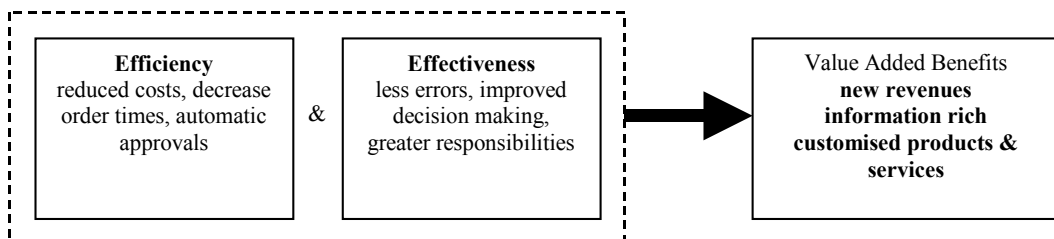


Figure 6: Criteria for eBT (matrix) Outcomes and Performance Objectives

Figure 6 illustrates the generic outcomes and performance gains and the relationships between them.

The performance gains for e-procurement were achieved from two sources; cost savings, and reduced cycle time from customer access (24x7) to supplier data. These projects enabled efficiency gains from minimising of delays in customer orders, and effectiveness gains from optimising employee/staff time. The cost savings through operational efficiencies of all equipment resourcing, compare favourably to those cost savings (efficiencies) in other e-procurement case studies. However, the improvement in staff QWL appears to be from learning of new skills, understanding of processes and acceptance of new responsibilities with greater flexibility.

By taking a more holistic approach, executives can turn these facets of a company's operations into the drivers of e-business excellence. So the central task for senior managers lies in understanding what drives operational excellence in the e-ERP realm, and then committing the necessary resources (structures, training, responsibilities) to the development of the drivers.

To this end managers should assess the company's operations by looking at both the traditional and e-business measures. For example, Dell and some Siemens companies used the same internal performance measures in both e-business and traditional business operations.

Extended Performance Objectives from Virtual Organising

Table 5 describes the outcomes and performance objectives, within the VOing research model as; (i) improved operating efficiency (ROI), (ii) virtual and economic value adding (EVA), and (iii) sustained innovation and growth (SIG). The latter of these three metrics of VOing proposed by Venkatraman and Henderson, (1998) extend the findings from the case studies to a measure for inter-organisation or B2B activity. This suggests a measure for successful relationships building.

Table 5: Summary Map Virtual Organising Stages of Development

	Stages of Development		
	1. Unit tasks	2. Organisation	3. Inter-organisation
Outcomes & Performance Objectives	Improved operating efficiency (ROI)	Virtual and economic value adding (EVA)	Sustained innovation and growth (SIG)
Examples	Customer service, purchasing, product development	Assemble and coordinate assets; creating value through use of digital info.	Business network to design and leverage interdependent e-communities

Measures of Benefits from B2B Interaction

The benefits constructs in the first column of Table 6 are a comprehensive list of outcomes or objectives of e-business excellence. This "B2B Benefits Scorecard" was established from the case findings as recommended criteria of e-business outcomes. In addition, specific outcomes and performance gains for each type of B2B interaction cell are to be found in Table 6. The greatest benefit was found to occur through B2B^C with B2B^S integration. Further, this corresponds to complementary benefits found to exist in this form of B2B partnering (see Table 4).

Table 6: B2B Benefits Scorecard

Model Benefits	B2E case #	B2B^S case #	B2B^C & (B2C) case #	B2B^C with B2B^S *case #
Reduce Costs	1	5, 6, 8, 9	10, (3, 4)	10, 11
Efficient Service	2, 7	5, 6, 8, 9	10, (3, 4)	10, 11
Shared Services	1, 2, 7	5, 6, 8, 9	10	10, 11
Revenue Generation		8	10, (3, 4)	10, 11
Quality of work life	1, 2, 7	5, 8		10, 11
Process Improvement		5, 6, 8, 9		10, 11
Customised service				10, 11
Relationships Building		5, 6, 8	10, (4)	10, 11

The real savings from integration of B2B back-end and front-end integration requires a dual approach (Perez; 1999: 53).

- inside-out optimisation of business processes witnessed by early adopters,
- outside-in optimisation of business processes driven by customer and supplier relationship management (CRM) and (SRM).

To realise the superior benefits the following critical factors were found to apply; (i) continuous improvement of the quality of the Web interface from the end-user’s perspective, (ii) formalise an agreement with partners on a common IT platform, (iii) standardise purchasing agreements with suppliers, and (iv) communicate the business strategy to employees.

8. Conclusions

A new conceptual framework of e-business transformation (eBT) demonstrates the stages of growth, in which improvement is along the three dimensions of business activity; *integration* is tempered by *differentiation*, for realising B2B *value propositions*. It identifies the antecedents of successful of e-business implementations within ERP environments (e-ERP). As a final research model of e-ERP phenomena it represents a triangulation of three interdependent research models; virtual organizing through e-ERP, e-business change with critical success factors and facilitators, and complementary benefits from B2B interaction. Each model exhibits attributes that have varying influences at different stages of e-business implementation.

The eBT model is essentially a diagnostic tool for identifying factors that contribute to success from adopting new e-business models. It is not seen as a prognostic tool. It specifically explores all areas related to the successful learning organisation where the key issues remain as people oriented organisational issues. The focus of management evolves through self-service, care and empowerment towards extensive relationship building with multiple alliances.

The proposed model of e-business transformation (eBT) can be used as a detailed criterion to direct and evaluate progress in the virtual space for traditional organisations or new entrants. The nature and value of the model is based on a set of exemplar SAP-

based organisations (innovators) that pioneered e-business implementations through their ERP systems for sustained competitive advantage. Although limited to discrete snapshots of each organisation's e-business transformation nevertheless the proposed model of eBT serves the purpose of demonstrating the transition rather well.

An eBT matrix represents the stages of growth development of a comprehensive and iterative plan that should assist managers of ERP-based organisations, in migrating their company towards a successful e-business organisation. The model offers a foundational perspective of strategies, tactics and performance objectives for e-ERP implementations. The strength of the theory lies in the synthesis of multiple case analyses using three different lenses over three separate time periods. The triangulation of the three research frameworks provides a method for study at appropriate levels of complexity. It is evolutionary in nature, and is content driven. Extra case material was gathered to validate the final research framework and to confirm the factors for success of an e-business implementation.

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