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## Transformation theory and e-commerce adoption

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# **TRANSFORMATION THEORY**

## **AND**

# **E-COMMERCE ADOPTION**

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BA, MA (Public Policy) (Science and Technology Policy)  
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23 February, 2006

Thesis submitted in fulfilment of the requirements for the award of  
Doctor of Philosophy, Information Science  
Edith Cowan University

Faculty of Computing, Health and Science  
(ECU)

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# Abstract

This thesis investigates business transformation on the Internet; particularly the nature and significance of Cyber transformation theory and the *Marketspace Model* as a framework for E-commerce adoption. E-commerce can raise a firm's productivity, transform customer relationships and open up new markets. The extent to which nations become adopters of E-commerce is set to become a source of comparative national competitive advantage (or disadvantage) in the twenty first century.

In a triangulatory research design, the study assesses Cyber transformation theory, firstly, by investigating association between Cyber transformation outcomes and E-commerce value creation outcomes in a sample of firms involved in E-retailing, and secondly, through a Cyber transformation quasi-experiment involving a group of firms. Further, the study investigates the nature and importance of various Critical Success Factors (CSFs) in E-commerce adoption, including early adopter advantage, product fit, usability, discovery, interaction, simulation and vividness. All firms in the study are drawn from the Australian Ecotourism industry.

The Cyber transformation quasi-experimental component of the study consists of an advanced transformation portal, constructed as a Co-operative Commerce (C-commerce) Web site. Firms participating in the portal study were provided with access to a mobile data integration capability forming the basis of an online resource and competitive advantage in destination marketing. Adoption outcomes were not sufficient for inferential statistical analysis, but permitted the exploration CSFs in Small-to-Medium Sized Tourism Enterprise (SMTE) C-commerce adoption in a case study approach.

Important findings from the survey component of the study encompass the finding that, within this industry/sector, a significant association exists between Cyber transformation and E-commerce value creation. Thus, the study contributes to knowledge by providing important evidence of the value of Cyber transformation theory and its logical place in the Resource Based Value (RBV) literature on E-commerce adoption. However, data analysis showed that the phenomenon was mainly attributable to Strategic Business transformation, and that both Technological Capability transformation and Usability did not significantly contribute to the observed effect. Further, using regression analysis, the study found that strategy was the best predictor of E-commerce value creation outcomes compared with other factors.

The study further contributes to knowledge by demonstrating how Social Network Analysis (SNA) methods can be used to analyze E-commerce knowledge and information flows that impact on clustering and Cyber transformation type innovation in a C-commerce setting. The application of such sociological methods to the quest for understanding of SME C-commerce represents a new and promising pathway in research that deals with the problem of how embedded network structure impacts on clustering and the diffusion process.

On the basis of a systematic investigation of sociometric data describing network interaction in the portal quasi-experimental group, the study suggests *heuristics* which, subject to further study aimed at validation, might be used by change agents pursuing SMTE or Small-to-Medium Sized Enterprize (SME) clustering around innovative Cyber transformation solutions that confer resource advantage. The study concludes with the suggestion of a *Network Analysis Framework for C-commerce* grounded in analysis of the portal quasi-experiment and wider research literature on SNA, diffusion of innovation and C-commerce adoption. The proposed framework combines Diffusion of Innovation (DOI) theory, SNA, knowledge

management and C-commerce theory with heuristic methods for change management in networks. The proposed framework is suggested for use by change managers in the project planning and feasibility evaluation stages of the C-commerce project life cycle.

### **Declaration**

I certify that this thesis does not, to the best of my knowledge and belief:

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Mark Brogan

23 February, 2006

### Related Refereed Publications

Discussion of interim findings and methods used in the study can be found in the following peer reviewed publications:

Brogan, M.<sup>1</sup> and Kohli, G.<sup>2</sup> (2003). Case Study in construction of a Vertical Portal: The Cape Range Ningaloo Project. *Proceedings of the Virtual Communities Conference, London, 16-17 June*. Infonortics (Eds.). Retrieved 14 July, 2003 from <http://www.infonortics.com/vc/vc03/slides/brogan-txt.pdf>.

Brogan, M. (2004). Cyber Transformation Theory: An E-Retailing Study from Tourism. *Proceedings of the 5<sup>th</sup> Annual We-B Conference*, 25-26 November, 2004 (pp.339-348). Perth: Edith Cowan University. School of Management Information Systems.

Brogan, M. (2005). Network Analysis Methods and Tools for SME C-commerce. *Proceedings of the 6<sup>th</sup> Annual We-B Conference*, 23-25 November, 2005 (pp.222-232). Melbourne: Victoria University. School of Information Systems.

Brogan, M.<sup>3</sup> and Armstrong, A. (2005). C-commerce innovation: Unraveling the Effects of Knowledge ties on Embedded Network Structure. *Proceedings of KMAP2005: International Conference on Knowledge Management in Asia and the Pacific*. 28-29 November, 2005 (pp.1-12). Wellington, NZ: Victoria University of Wellington.

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# 1 Introduction

## *Preamble*

This thesis investigates the phenomenon of business transformation using the Internet. The population on which the research is based consists of Small-to-Medium Sized Tourism Enterprises (SMTEs) operating in the Australian Ecotourism industry. The theoretical framework for the study is provided by management information systems theory concerning the importance of E-commerce strategy and the transformation of business models as necessary conditions for E-commerce adoption. In particular, the study draws upon Soumitra Dutta and Arie Segev's (2001) E-strategy theory, known as *Cyber transformation theory*, and a companion model describing dimensions of business transformation called the *Marketspace model*. The work assesses the value of Cyber transformation theory as an explanation of E-commerce adoption in online retailing. This assessment is achieved by analysing the extent and nature of transformation achieved by firms, and by exploring relationships between transformation variables and E-commerce value creation outcomes. Through the lens of a triangulatory component of the study, the portal quasi-experiment, findings from the empirical study are further explored using Web log analysis, qualitative methods and social network analysis.

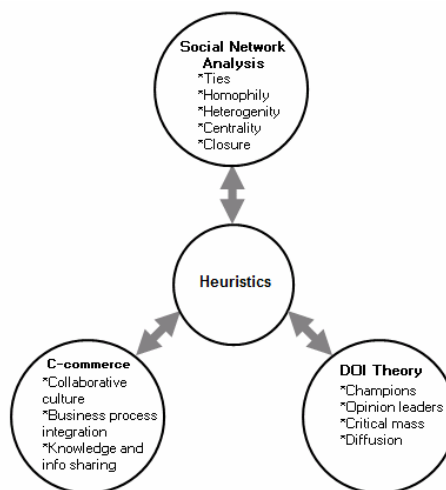
The selection of methods applied to the portal quasi-experiment reflects both the research questions adopted for the study and important directions in the research literature on E-commerce adoption. These directions concern:

- the role of strategy in E-commerce adoption (Evans & Wurster, 1999; Harmon, Rosen & Guttman, 2001; Golden, Hughes and Gallagher, 2003; Straub & Klein, 2001; Dutta and Segev, 2001; De Waal, 2004; Bode, 2002; Korchak and Rodman, 2001);



- Critical Success Factors (CSFs) in the evolution of SME E-commerce into C-commerce (Braun, 2003; McGrath & More, 2002; Rowe, 2004; Nodder *et al.* 2003);
- the applicability of mainstream innovation theory, such as Rogers' (1995) Diffusion of Innovation (DOI) Theory, to the understanding of SME networks and how these networks contribute to SME clustering and diffusion of E-commerce best practices (Braun, 2003; Nyholm, 2001, Roberts and Toleman, 2004); and
- the role of social network analysis in understanding information and knowledge seeking behaviour in social networks (Borgatti and Cross, 2003).

The role of strategy in E-commerce adoption has an established research literature. The application of C-commerce, social network analysis and innovation theory to SME E-commerce adoption involves new directions and an emerging research literature. Figure 1.1 depicts a framework for network analysis that emerged from consideration of adoption outcomes achieved in the Cyber transformation portal quasi-experiment:



**Figure 1.1 C-commerce, Social Network Analysis and Innovation Theory (Brogan, 2005)**

*Heuristics* in the diagram consist of rules that change-managers can apply in the interpretation of network analysis outcomes. Application of heuristics results in a view of C-commerce potential and provides input to the selection of network tactics for clustering around shared technology platforms. This introduction provides:

- an overview of the research;
- an overview of its contribution to knowledge in E-commerce adoption research;
- an introduction to Cyber transformation theory and business transformation on the Internet;
- an introduction to E-commerce value creation measurement; and
- an introduction to innovation policies for E-commerce.

The discussion forms the basis of the subsequent literature review in *Chapter Two* and justifies the research in terms of the significance of the research questions.

### *1.1 Overview of the research*

The research described in this thesis was carried out during 2001-2004. A timeline for the research is described in *Chapter Five*. Using a combination of survey and quasi-experimental methods, the research attempts to establish the usefulness of Soumitra Dutta and Ariel Segev's (2001) *Marketspace model* and *Cyber transformation theory* as explanations for E-commerce adoption. The research also aims to provide insights into:

- SME E-commerce adoption fundamentals in an industry/sector with good *product fit* to the Web channel, namely, Ecotourism; and

- the application of social network analysis methods to the problem of understanding information and knowledge flows in an SMTE network and hence, the contribution of network factors to innovation and Cyber transformation outcomes in a case study context i.e. the portal quasi-experiment.

Research questions are described in section 1.4 and related hypotheses in *Chapter Four*.

The subjects for this research comprised SMTEs in the Ecotourism sector of the Australian tourism industry. The logic of population selection for the study is discussed in *Chapter Five*. The sample for the quantitative study comprised one hundred and eight (n=108) firms drawn from an original population of one hundred and fifty (N=150) Ecotourism Australia Accredited Ecotourism service providers. Firms in the study were selected according to a stratified random sampling method based on the parameters of region and sector (Accommodation, Tours and Attractions).

Two survey instruments were applied, the first a *Cyber transformation scale*<sup>1</sup> was used to inspect E-commerce Web sites to determine the extent of Cyber transformation achieved by firms in the sample. Approximately 6,000 discrete tests involving dichotomous and rank data were performed in this way covering the Technological Capability (TC), Strategic Business (SB) and Usability dimensions of the enhanced *Marketspace Model* adopted for the study.

The second instrument applied, the *E-commerce Adoption Survey*<sup>2</sup>, was used to measure E-commerce value creation outcomes and aspects of E-commerce

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<sup>1</sup> Appendix I

<sup>2</sup> Appendix II

strategy and practice in the same 108 firms. A total of 46 firms participated in the E-commerce Adoption Survey representing a response rate of 42.6% ( $n=46$ ,  $s=108$ ,  $r\%=42.6\%$ ). The survey employed a 68 item scale encompassing firm demographics, modes of operation, E-commerce value creation, competitiveness impact assessment, investment in B2C Web commerce and E-strategy. A further 2,000 discrete measurements were made using this instrument, comprising dichotomous and scale data.

The quasi-experimental<sup>3</sup> component of the study consisted of a 'proof-of-concept' vertical market portal or 'vortal' (Palmer and Panopoulos, 2001) that was applied to a regional Ecotourism marketplace, namely, the world heritage region of Cape Range Ningaloo in the mid north of Western Australia. Subjects participating in the experiment comprised Ecotourism owner/operators in the region, located some 1270 kilometres north of Perth, the capital of Western Australia. In 2004, the Cape Range Ningaloo region was the subject of a world heritage listing consultation (Government of Western Australia, 2004). The region is home to a vibrant Ecotourism industry, mainly based on marine Ecotourism. The portal provided a Cyber transformation rich Web capability incorporating:

- a Co-operative shared infrastructure E-commerce business solution based on 'E-mall' (Timmers, 1998) principles available to all providers in the region;
- a regional hub and directory service for the industry;

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<sup>3</sup> Quasi-experiment i.e. an experiment conducted under field conditions outside the context of laboratory controls and where the practice and real usage of a system are primary subjects for investigation (Cook & Campbell 1979, O'Hara 1999).

- access to a resource of interpretive information on the ecology and biodiversity of the region;
- access to advanced channel services (such as mobile data integration via the Simple Messaging Service or SMS) for destination marketing and customer relationship building.

The portal was created between 2001 and 2003. Two fieldwork trips were made to the Ningaloo region in 2002 and 2003 to introduce stakeholders to the project, pilot instruments and gather data. Quantitative analysis of portal logs, qualitative analysis of interviews with experiment participants and an analysis of the social network for E-commerce information and knowledge interchange encompassing members of the portal group forms the basis of quasi-experimental analysis.

Thus the research can be regarded as a 'triangulation' (Sarantakos, 1998, p.168) involving both survey and quasi-experimental research, in a design involving both quantitative and qualitative investigation.

### *1.2 Contribution to knowledge*

The contribution to knowledge made by this research is discussed in detail in *Chapter Nine*. In summary, subject to its limitations, the research contributes to knowledge by:

- comprehensively operationalizing Cyber transformation theory and the Marketspace model inclusive of factors in the Technology Capability, Strategic Business and Usability domains. As a consequence, the largely descriptive work performed by Dutta and Segev in 2001 has been extended;
- demonstrating that in an industry/sector with good product fit to the Web channel, Cyber transformation and the *Marketspace*

*Model* are *significantly* positively associated with two important B2C E-commerce metrics- *B2C revenue* and *online sales leads*. The study is the first of its kind to establish the essential usefulness of Cyber transformation theory and the *Marketspace Model* as predictors of E-commerce value creation outcomes. The study also addresses what Zhu and Kraemer (2002, p.276) describe as a deficiency in the Resource Based Value (RBV) E-commerce literature, namely, “the absence of empirical data to gauge the scale and characteristics of Internet initiatives and their impact on firm performance”;

- establishing that *highly* significant positive association exists between the Strategic Business (SB) dimension of the *Marketspace Model* and E-commerce value creation outcomes. From the results of testing, and within the constraints of the research, it is clear that transformation in the SB dimension is more closely associated with E-commerce value creation than Technological Capability (TC) transformation in this industry/sector;
- establishing within a case study collaborative SMTE E-commerce innovation context, the role of network and innovation theory in understanding Co-operative or so called C-commerce adoption outcomes. In this respect, the work further evolves understanding of Critical Success Factors (CSFs) at work in Cyber transformation innovation in an SME setting and addresses Braun’s (2003, p.5) call for analysis methods that help “untangle the effects of the embedded network structure on the diffusion process”. These new directions combine aspects of knowledge network theory (Keeble and Wilkinson, 2000; Apostolou, Mentzas and Maas, 2005, Borgatti and Cross, 2003); diffusion of innovation theory (Granovetter, 1973; Freeman, 1991;

Rogers, 1995); and social network analysis theory (Krackhardt, 2000; Breiger, 2004; Hannemann, 2001) in a proposed *Network Analysis Framework for C-commerce*. Application of the framework to the portal quasi-experiment adopter group, enabled derivation of a sequence of network *heuristics* for the direction of change managers involved in C-commerce clustering.

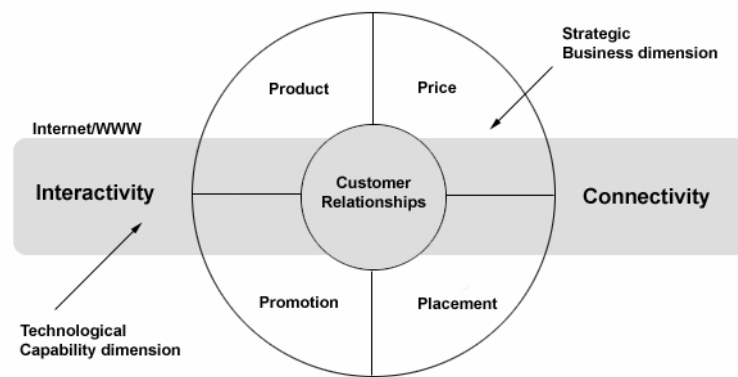
### 1.3 E-commerce adoption: Towards a theory of Cyber transformation

Cyber transformation theory was developed at the Centre for E-Business Research at the University of Texas in the late 1990s and unveiled formally in a sequence of articles and presentations by Dutta and Segev in 2001. Like their contemporaries, Dutta and Segev (2001) asked the question of how *bricks and mortar* firms could make a successful transition to the so-called world of *clicks and mortar*.

Dutta and Segev's prescription was based on the idea that business models and processes must be *transformed* for Cyberspace. This transformation must be two-dimensional involving:

- a Technological Capability dimension based on *Interactivity and Connectivity*; and
- a Strategic Business dimension constructed around the factors of products, prices, promotion and placement (recognizable as the four Ps of the traditional market model) and customer relations.

The dimensional character of the required transformation is captured in Dutta and Segev's so-called *Marketspace* model; see Figure 1.2, a description of the business decision domain for Cyberspace (Dutta and Segev, 2001, p.6):



**Figure 1.2 Dutta and Segev's Marketspace Model**

Dutta and Segev's theory of Cyber transformation and companion *Marketspace* model belong to the E-strategy school of thinking about online retailing. Businesses must transform their business models to exploit the potential of the Internet as a business channel. The *Marketspace* model suggests the dimensions for the business model transformation.

To see if these ideas resonated with actual practice in E-commerce adoption, Dutta & Segev (2001, p.8) translated their *Marketspace* model into a set of transformation criteria that formed the basis of a scale which they subsequently applied to a sample of firms. The sample constructed was purposive, comprising companies selected from the Fortune Global 500 list, but broadly representative of major industries (communications, transport, entertainment, *et cetera*) and sectors within these industries. The Fortune Global 500 list is an elite ranking of the world's top five hundred companies by revenues (Fortune, 2004).

Performance of companies in the survey sample was evaluated against the transformation criteria. The extent of transformation achieved based on each of the dimensions was captured as score data. Dutta and Segev rated overall transformation in the sample as unexpectedly poor (*ibid*, p.10):



Few firms are re-thinking their business models to take advantage of the unique interactive and connective capabilities of the Internet. Most firms are stuck in the first stage of exploitation of the Internet: publishing corporate, and in many instances, product information. Few have actually moved onto the next stage – conducting electronic commerce; only about one third of the surveyed firms allow electronic ordering and payment. Even fewer have tried to shift gears into the third and most interesting stage of Internet exploitation: business transformation in Cyberspace. In our study, less than 20% of the surveyed firms allowed for the formation of Cyber-communities among customers and very few were innovative in stimulating intra-community interactions.

Performance was best in customer relationships, where the potential of the Web had been recognized. Product customization was rare (*ibid*, p.12) and less than half of all surveyed firms allowed online ordering of products (*ibid*, p.14). The United States was a leader across all dimensions of the *Marketspace* model compared with Europe and the Asia Pacific (*ibid*, p.15). By industry, media and entertainment firms obtained the highest scores across nearly all dimensions excepting price, where travel and transport firms recorded superior performance (*ibid*, p.16).

Dutta and Segev (*ibid*, p.18) concluded that two thirds of surveyed firms were “simply treating the Internet as a publishing medium” and that very few firms were “actively using the Internet for launching new business models.” The study raised questions concerning the maturity of decision making by firms about doing business online and the ability of firms to understand the characteristics and potential of the Web as a business channel.

### 1.3.1 Significance of Cyber transformation theory

The significance of Dutta and Segev’s (2001) work lies in:

- its aggressive emphasis on E-strategy and business transformation as necessary conditions for successful *bricks and mortar* transition to the online business domain; and
- the articulation of a dimensional model inclusive of systems, business strategy and customer relationships.

Dutta and Segev's study attempted to draw the results of various Critical Success Factor (CSF) studies in E-commerce adoption into a theoretical framework for doing business online. However, the study arrived too late to exercise much influence over business investment decisions and the cautionary message conveyed seemed hollow as the *dot.com* disaster unfolded in 2000-2001.

Cyber transformation theory is not the only explanation for doing business online and examination of the literature shows that a variety of studies have looked at CSFs in online retailing. For example, Golden, Hughes and Gallagher (2003, p.32) found that specific organizational factors such as early adoption of web technology, internal Information Systems/Information Technology (IS/IT) expertise and an organizational champion for E-commerce were significantly related to successful E-commerce adoption in firms. Although they did not adopt the *Marketspace* model and related transformation criteria for their descriptive study, Golden, Hughes and Gallagher (*ibid*, p.32) also found that E-strategy was significantly related to E-commerce success.

The work discussed so far is but a sample of a vast literature on E-commerce adoption in firms that is explored in more detail in *Chapter Two*. The literature is divisible into themes which provide the organizational basis of the review. This thematic discussion of the literature is inclusive of views that frame E-commerce as:

- revolutionary in the history of business and a phenomenon demanding new methods and approaches;
- a phenomenon that is new, but which should be treated in accordance with established business methods; and
- a phenomenon in which strategy is all important.

Analysis of the existing literature also reveals conceptual differences between researchers in terms of the mission and objectives of E-commerce adoption research. Some researchers have aimed to develop comprehensive theoretical frameworks and models, while others have been content to work at the level of CSFs. Both approaches are explored in *Chapter Two*.

#### *1.4 Research Questions (RQs)*

The main limitation of Dutta and Segev's work is a failure to expand its scope beyond the initial descriptive study based on Web site evaluations to include investigations of the association between:

- Cyber transformation and E-commerce value creation outcomes;
- dimensions of transformation (Strategic Business, Technological Capability) and E-commerce value outcomes; and
- clusters within these dimensions and E-commerce value outcomes.

The current study attempts to address this limitation and, thus, to move beyond a purely descriptive view of Cyber transformation theory to one grounded in E-commerce adoption outcomes achieved by firms.

The following Research Questions (RQs) are investigated:

RQ1: To what extent do Australian SMEs in an industry with good product fit to the Web channel demonstrate Cyber transformation?

RQ2: What relationship, if any, exists between increasing Cyber transformation and E-commerce value?

RQ3: Which *dimensions* of transformation and, which *clusters* within these dimensions, are important in determining E-commerce value outcomes?

RQ4: How useful is *Cyber transformation theory* as an explanation for E-commerce adoption?

RQ5: What role do networks play in collaborative Cyber transformation innovation in an SMTE network?

The Research Questions and related hypotheses are fully explored in *Chapter Four*.

### 1.5 Significance of the study

The study is significant as an investigation of:

- CSFs and frameworks for E-commerce adoption;
- the validity of a theory that seeks to explain E-commerce adoption, namely, *Cyber transformation theory*;
- SME E-commerce adoption in an industry (Ecotourism) of national economic significance; and
- ad-hoc SMTE knowledge networks and their role in Cyber transformation innovation based on C-commerce principles.

Tourism accounted for \$32.0 billion of Australia's total GDP in 2000-03 (Australian Bureau of Statistics, 2004,p.3) and 11.2 percent of Australia's total exports of goods and services (*ibid*, p.8). The importance of tourism in Australia's GDP and export profile, paired with the increasing use of the World Wide Web by consumers for destination planning and procurement<sup>4</sup> suggests the significance of the study's Research Questions (RQs).

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<sup>4</sup> Vide Section 5.2 p.144

Furthermore, the proliferation of theories and an under supply of scholarship concerned with their validation, deprives business decision makers of important guidance in determining the most effective allocation of resources and strategies for E-commerce. The consequences of poor decision making are vividly demonstrated by the events surrounding the so-called dot.com meltdown.

*1.5.1 Significance: The quest for understanding E-commerce Adoption and legacy of the dot.com meltdown*

The arrival of the World Wide Web in 1992, offered business a multimedia-based information system that could be used to develop new markets and ways of doing business. Enthusiasm for doing E-commerce via the Web resulted in a wave of company start-ups, new online business models and the emergence of online markets for products and services. In the United States of America (USA), between 1993 and 2000, venture capital flowed freely into Internet business ventures. The excitement of the era spawned evangelists for doing business over the Web, each with a different take on the formula for success. In Australia, the small size of venture capital markets resulted in fewer Internet only start-ups, with action mainly centred on traditional *bricks and mortar* firms aspiring to exploit the business potential of the new Web channel (Caslon Analytics, 2004, p.1).

Variously described as the *dot.com meltdown*, the bursting of the *dot.com bubble*, or the *dot bomb*, the period from April to December 2000 saw a dramatic decline in the value of *dot.com* stocks, the contraction of venture capital markets and the entry into receivership of many *dot.com* enterprises. In the USA, losses in market worth for the top 280 stocks on the Bloomberg Internet Index were reckoned at \$US 1.75 trillion for the year (Elvin, 2002, p.10). The reason for the collapse was a loss in investor confidence in the sector fuelled by sustained poor earnings performance and inflated price to earning ratios (Elvin, 2002; Tassabehji, 2003). The collapse initiated a three year decline in

technology stocks and contraction in equity markets. During the period March 31, 2000 through July 19, 2002, the Standard & Poor's 500 Stock Index lost 41.7% of its value, and the NASDAQ Composite devalued by 71% (Tweedy Browne, 2002, p.1).

Implications of the meltdown for E-commerce activity and research have been substantial. Along with a decline in interest in the Web as a channel for E-commerce, the period since December, 2000 has seen the rejection of ideas from this earlier period of investigation. For example, the significance of Hagel and Armstrong's (1999) *Net Gain*, a seminal work on virtual communities and a best seller, has been re-evaluated:

*Net Gain* has become a bit of a classic, if only in a negative sense. In our opinion, the virtual communities of Hagel and Armstrong did not stand the test of time. They were wiped out in the e-crash at the end of the 20th century. Perhaps the world is not yet ready for business-driven virtual communities. More likely, however, virtual communities really do exist. They just do not offer the business potential or serve that business purpose that Hagel and Armstrong foresaw. The foundations of virtual communities, like real communities, form more from social and cultural bonding than business imperatives.

(The Wave Form Group, 2003)

In common with other areas of E-commerce research, there has been little interest in Cyber transformation theory since 2001 and E-commerce has lost its gloss in academic research. Drew comments (2002, p.18):

The sobering experience of numerous *dot.com* failures, earnings disappointments and corporate restructurings has taken the bloom off the rose. MBA graduates have now turned to the pursuit of traditional career paths in safer industries. Business Schools are re-evaluating the place of E-commerce in the curriculum.

In Australia, enthusiasm for the Cyber economy has cooled, giving way to ambivalence and a 'foot off the pedal' attitude towards E-commerce seen in government and private sector decision making. In a major review of public policy for E-commerce adoption in Australia scheduled for publication in

2004<sup>5</sup>, the author argues that such attitudes have eroded the early adopter advantages enjoyed by Australia in Internet E-commerce, and are not shared with important competitors in the global economy (Brogan, 2004, p.18). The perception that Australian attitudes towards E-commerce have become negative in the wake of the *dot.com* downturn has provided an impetus for this study. While Australian companies have been re-evaluating their commitment to doing business online, their international competitors in the world economy have remained committed. As Daniel Franklin of The Economist comments:

E-transformation has become the silent revolution. The frenzy of the dotcom years has gone, but the quiet work of harnessing the Internet to drive efficiencies in both business and government has, if anything, intensified.

(Economist Intelligence Unit, 2003, p.1)

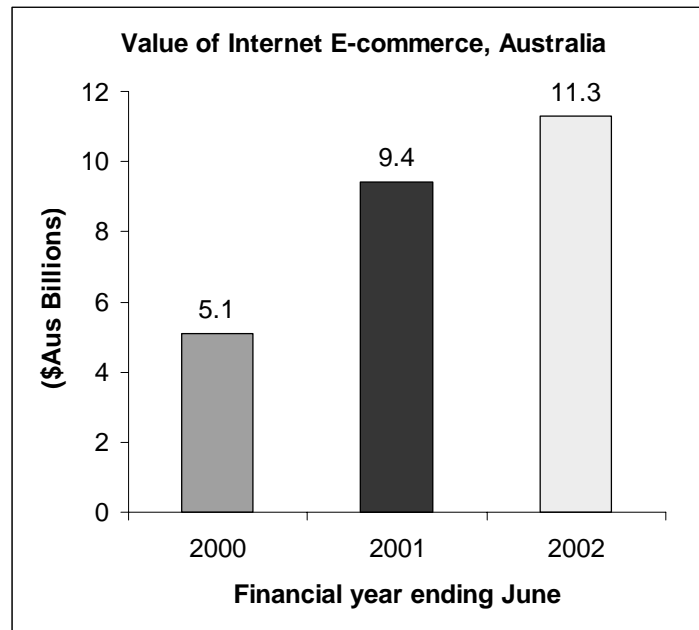
It is arguable that the collapse of interest in E-commerce and Cyber transformation in the wake of *dot.com* is overreaction and no better than the “irrational exuberance” (Shelly, 2000) that fuelled the crash. Since 2003, there have been many examples of profitable E-commerce ventures on the Web and new business models based on mobile technologies and embedded systems are emerging. In *Business Week*, Timothy Mullaney (2003, p.1) reported:

In spite of the wretched economy and molasses-slow corporate spending on technology, profitable Web companies are no longer weird or even unusual. The tally of profitable Internet companies in the fourth quarter reached 84--more than 40% of the 208 publicly traded Net companies tracked by stock researcher Pegasus Research International LLC. That's up from 49 profitable dot-coms for the first quarter of 2002, the last time Business Week conducted such a survey. In key areas such as e-tailing and online finance, profitability has become the rule rather than the exception. And those profits are measured by generally accepted accounting principles--no “pro forma” tallies need apply.

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<sup>5</sup> Vide Brogan, M. (2004). *Innovating for a digital economy: E-commerce innovation in Australia 1993-2003*. Retrieved 22 February, 2004 from <http://scisrange.scis.ecu.edu.au/mb/ide.pdf>

In Australia, the value of E-commerce has continued to grow. Figure 1.3 shows the value of E-commerce conducted over the Internet (Business-to-Business and Business-to-Consumer combined) over the period 2000-2003 (Di Gregorio, 2003).



**Figure 1.3 Value of Internet E-commerce (2002) Source: Statistical Analysis Section (NOIE)**

These figures show continuing growth in the value of all forms of Internet E-commerce, reckoned in 2002 to account for 2.5% of GDP.

It is timely to re-visit Cyber transformation theory, and to assess its value and future in E-commerce studies. Research outcomes here are expected to provide guidance to Australian industry and policy makers on:

- the factors that constitute Cyber transformation and how it can be measured;
- whether the pursuit of higher order transformation outcomes is likely to pay off in terms of return on investment, *ceteris paribus*; and



- which clusters and transformation factors are more important than others in doing business successfully online in B2C mode.

Furthermore, the projected study is important because:

- Knowledge Intensive Business Services (KIBS) (Windrum and Tomlinson, 1999) have been identified as a major engine of economic growth;
- benchmarked against other nations, Australia's performance in E-commerce may be decreasing; and
- evidence has been accumulated by the Australian Bureau of Statistics (ABS, 2002b) and others that low level transformation is characteristic of Australian Small-to-Medium (SME) size enterprise;
- clustering of Australian SME E-commerce effort involving C-commerce industry and regional networks, offers promise of overcoming problems of scale and resource scarcity that undermine global competitiveness (Braun, 2003; McGrath & More, 2002; Rowe, 2004; Nodder *et al.* 2003).

The *Chapter* continues with a discussion of these issues, which together frame the study in terms of national significance.

#### *1.5.2 E-commerce services, Gross Domestic Product and Australia in the Age of the Information Economy*

E-commerce adoption is a service type innovation with economic significance. The extent to which nations innovate, is an important determinant of their economic prosperity. Even with a relatively unchanging rate of innovation, a nation's economic output can be expected to increase steadily as a

consequence of innovation. According to economists Baumol and Blinder (2003, p.266):

Each successful innovation adds to the nation's Gross Domestic Product (GDP), either by permitting firms to create more products with a given quantity of resources (a process innovation) or by making a new and more valuable product available (a product innovation).

The application of robotics to the manufacture of automobiles is an example of the kind of *process innovation* that Baumol and Blinder have in mind, but recent research has focused attention on the importance of *services innovation* in fuelling economic growth. E-commerce services such as Internet Service Provision and E-commerce applications development are strategic *Knowledge Intensive Services (KIS)* (Windrum and Tomlinson, 1999) that reduce costs in much the same way as traditional process innovation, but also involve *new economy* advantages associated with access to nascent markets and with globalization of economic activity.

The role of KIS in economic growth has been the subject of a revolution in innovation theory over the past decade. Quinn (1992), Reich (1991), Illeris (1996), and Windrum and Tomlinson (1999) are illustrative of a generation of innovation theorists who focus on the role of strategic *services* in shaping competition and comparative advantage between nations. Windrum and Tomlinson (*ibid*, p.3) are particularly concerned with the role of KIS as engines of economic growth:

As knowledge has overtaken material inputs as the source of value added, so high tech and highly innovative service sectors have become important to national productivity and competitiveness.

In another context, Windrum (1999, p.41) argues that KIS can significantly contribute to economic growth and "the wider innovation network as agents of technology transfer." Feedback from Internet and Information and Communications Technology (ICT) KIS type services is particularly important (*ibid*, p. 41):

We see a positive feedback between new technologies and new services. New technologies have spawned new service industries that have in turn played a major role in developing these technologies through laboratory, design and engineering activities. Notable examples include the KIS services connected with biotechnology, new materials, environmental technologies and ICT's such as the Internet.

Pilat (2000) categorizes E-commerce as a *Knowledge Intensive Business Service (KIBS)*, whose role is two fold: either KIBS can become nodes in innovation networks and/or through homeostasis contribute to traditional innovation (Pilat, 2000, p.14):

These knowledge-intensive business services (KIBS) thus facilitate innovation in other firms and are an important source of innovation (Den Hertog and Bilderbeek, 1998). They rely on highly specialist skills, are important users of IT and are generally regarded as making an important contribution to the "distribution power" of national innovation systems and helping to improve the economic performance of the system as a whole.

Thus, over the past decade, economists and innovation theorists have expanded understanding of the nature and importance of services innovation as a source of economic growth. In particular, E-commerce has been identified as an important area of services innovation, with clear implications for economic growth and competitive advantage between nations. Dunt and Harper (2002, p.335) in a review of the implications of E-commerce for the Australian economy, argue that it functions as a key export enabler and that:

E-commerce will have its greatest impact on service and knowledge based industries. Knowledge based industries use information intensively. For this reason the Internet and E-commerce will enhance the growth of service exports.

In 2000-01, services exports accounted for 22 percent of Australia's total exports, compared with 32 percent for manufacturing and 46 percent for primary products (*ibid*).

### 1.5.3 Benchmarking Australia's performance in E-commerce

Before 2000, differences in national systems for measuring E-commerce activity made problematic the benchmarking of Australia's performance in E-commerce innovation against its international competitors. In 2000, the Organization for Economic Co-operation and Development (OECD, 2002,

p.61) secured member agreement to standard definitions for online transactions, thereby enabling reliable, granular, international comparisons of revenue earned.

In a report published in 2002, OECD assembled for the first time comparative data based on these definitions, subject to the caveat that “comparisons still need to take into account differences in the type of definition used in surveys and in their coverage” (*ibid*). In the financial year ended 30 June 2001, business sector Internet sales in Australia accounted for 0.7% of the total sale of goods and services for the period, making it a middle ranking performer when compared with European nations such as the United Kingdom (1.8%), Spain (1.4%) and Austria (1.0%)(*ibid*). The outstanding performer was Sweden, a nation likened to Australia, but which recorded 2.0% of sales in the category of Web commerce (*ibid*).

In 2003, The Economist in co-operation with IBM, surveyed 60 of the world’s largest economies for E-readiness. Conducted over 100 qualitative and quantitative criteria, the Economist/IBM study found that Australia’s overall ranking had fallen from sixth in 2002 to ninth in 2003 (Economist Intelligence Unit, 2003, p.4). Australia remained the regional Asia/Pacific leader, with strong regional challenges emerging from Hong Kong, Singapore and South Korea (*ibid*). Figure 1.4 describes Australia’s relative position in terms of E-readiness:

<i>The Economist Intelligence Unit: e-readiness rankings 2003</i>				
2003 E-readiness ranking (of 60)	2002 Ranking	Country	2003 E-readiness score (of 10)	2002 score
1	4 (tie)	Sweden	8.67	8.32
2	7	Denmark	8.45	8.29
3 (tie)	2	Netherlands	8.43	8.40
3 (tie)	1	US	8.43	8.41
3 (tie)	3	UK	8.43	8.38
6	10	Finland	8.38	8.18
7	11 (tie)	Norway	8.28	8.17
8	4 (tie)	Switzerland	8.26	8.32
9	6	Australia	8.25	8.30
10 (tie)	9	Canada	8.20	8.23
10 (tie)	14	Hong Kong	8.20	8.13
12	11 (tie)	Singapore	8.18	8.17
13	8	Germany	8.15	8.25
14	13	Austria	8.09	8.14
15	15	Ireland	7.81	8.02
16	21	South Korea	7.80	7.11
17 (tie)	16	Belgium	7.78	7.77
17 (tie)	18	New Zealand	7.78	7.67
19	17	France	7.76	7.70
20	20	Taiwan	7.43	7.26
21	19	Italy	7.37	7.32
22	24	Portugal	7.18	7.02
23	22	Spain	7.12	7.07
24	25	Japan	7.07	6.86
25	26	Israel	6.96	6.79
26	23	Greece	6.83	7.03
27	27	Czech Republic	6.52	6.45
28	28	Chile	6.33	6.36
29	29	Hungary	6.23	6.05
30	31	Poland	5.57	5.52
Source: Economist Intelligence Unit				

**Figure 1.4 Australia's E-Readiness Ranking 2003 (Source: The Economist Intelligence Unit, 2003, p.10)**

Although Australia was an early adopter of E-commerce on the Internet and an early pace-setter, the evidence presented from OECD (2002) and The Economist Unit (2003) suggests that benchmarked against other nations, Australia's performance may be slipping. The skewing of Australian

economic activity toward micro and small business, is a structural issue with implications for Australia's export performance and E-commerce adoption outcomes. Ninety three per cent of all Australian businesses are classifiable as SMEs (Austrade, 2002, p.8). The percentage of these SMEs exporting is comparable to the United States (*ibid*, p.13). Both nations are 'cellar dwellers' in terms of export orientation by SMEs, with less than 5% of SMEs involved (*ibid*). With low or no export orientation, a major incentive to E-commerce adoption, the harnessing of new markets is removed. Harcourt (2002) sees the relationship between SME export orientation and E-commerce as a pivotal one for Australia. Although gains are being made in this area by Australia's SMEs (*ibid* p.1), it is not clear that these gains will preserve Australia's overall position in terms of revenue generated from online activity. Of course, *E-Readiness* rankings provide no measure of business transformation achieved online. Existing research, however, has suggested that low-level transformation outcomes are typical (ABS, 2002; Bode, 2002; Braun, 2003). The Australian Bureau of Statistics (ABS) surveyed the use of information technology by Australian businesses in 2002 concluding that:

Generally, the methods of Internet commerce used by Australian businesses appear to be low technology and simple in process. For example, of the businesses earning income from the sale of goods and services via the Internet or web during the financial year to June 2001, just under one third received orders via the Internet, but had no web site. This would indicate that their Internet commerce was unsophisticated and probably restricted to fairly simple email orders.

(ABS, 2002b, p.9)

Of the businesses that had a Web site, ABS (*ibid.*) found that:

there were varying degrees of sophistication in the Internet commerce facilities they offered. For example, on their web sites:

- 39% have online ordering
- 14% have online payment capabilities
- 11% offer secure access or transactions (eg secure socket layers)
- 10% have shopping cart facilities.

However, half of the businesses which received orders via the Internet during 2000-01 had established a web presence without any of the above four features. Consequently the Internet commerce facilities they offer are unlikely to be sophisticated.

Observations concerning the quality of SME online effort, have resulted in an emerging literature that emphasizes the importance of clustering, networking and community building for E-commerce innovation (Braun, 2003; McGrath & More, 2002; Rowe, 2004; Nodder *et al.* 2003). From the securing of a resource advantage (Lucas, 2002) to market access, synergistic and value creation partnership benefits (Rowe, 2004) co-operative activity offers many opportunities to leverage online activity more effectively and address competitive disadvantages arising from small E-commerce budgets and problems with access to expertise and resources.

Knowledge diffusion of the related ideas of good practice in doing business online and business transformation over the Web channel is going to be an essential task in Australia's national system of innovation for E-commerce in the future. While, the current research does not address the velocity of knowledge diffusion of good practice in doing online business, it addresses factors in the operation of networks forming *barriers* and *drivers* to Cyber transformation innovation in an SME industry context.

#### 1.5.4 E-commerce and the firm

Firms contemplating, or doing online retailing, must make decisions about the business model, the business transformation potential of the Web for their product or service, and the extent of organizational commitment to the Web channel. Furthermore, these decisions should involve evaluation of business opportunities for the firm and threats from competitors. This study aims to assist businesses by shedding light on the important question: *Is commitment to E-commerce involving higher degree transformation of business models and practices going to be rewarded in terms of E-commerce value creation outcomes?*

The disadvantage for businesses pursuing such an approach to E-commerce adoption, include increased outlays for the planning, design and implementation of Web sites. Greater upfront costs in Web site construction is not the only issue. Re-current costs may also be increased since higher degree transformation can result in more site traffic and can include Search Engine Optimization (SEO) fees and charges. Business needs to know whether higher levels of investment and commitment are likely to generate improved E-commerce outcomes.

In a recent review of E-commerce metrics and the value of E-commerce to firms in the manufacturing sector, Zhu and Kraemer (2002, p.276 ) lament that in spite of a revival of interest in E-commerce since *dot.com*, firms have not benefited from research that has quantitatively matched “the scale and characteristics of Internet based initiatives” with impacts on firm performance. Rather, because of the difficulty of determining what data to collect and of actually collecting them:

most of the existing evidence regarding such issues tends to be either anecdotal or qualitative in nature. Case studies on companies such as Dell and Cisco provided insights into business use and benefits of ecommerce, but are the findings of these case studies specific to a few “leading edge” firms, or are the lessons more widely applicable?

*(ibid)*

The study seeks to address what Zhu and Kreamer (2002) regard as a deficiency in empirical research that relates E-commerce capabilities to firm performance within the domain of SMTEs. It also seeks to provide an explanation of which transformation dimensions and/or clusters display relationships with E-commerce value creation outcomes. In this way the research aims to assist SMTEs with the development of their E-strategy.



### 1.6 Organization of the Study

The research questions investigated by this thesis concern the nature and value of Cyber transformation theory as a prescription for E-commerce adoption.

Chapter Two, the *Literature Review: E-commerce Adoption*, explores themes in E-commerce adoption research including CSF type analysis and theoretical frameworks that integrate CSFs into comprehensive frameworks. This chapter also critiques Cyber transformation theory, laying the foundations for an enhanced model that encompasses new work in end-user and user-centred computing. The revised model is subsequently operationalized as a Cyber transformation scale that is applied to a sample of SMTE firms involved in E-retailing. Review of the literature on E-commerce value creation suggests a combination of financial and E-metrics that are used in the study to measure E-commerce adoption outcomes in firms. Chapter Two also explores the evolution of E-commerce to encompass the notion of C-commerce (Ward, 1999; Maynard, 1999, GartnerGroup, 1999; Rowe, 2004) ;

Chapter Three, the *Literature Review: Research Design* investigates the research literature that concerns operationalization of the enhanced model developed in Chapter Two. This review explores the research literature on Usability; interactivity and connectivity; and business transformation that informs design of the survey and other instruments used in the study.

Chapter Four, the *Research Questions and Hypotheses*, states and describes questions and hypotheses identified for investigation. One such question, concerns a possible focal relationship between Cyber transformation and E-commerce value creation. If Cyber transformation theory is to be advocated as a basis for E-strategy decision making by firms, then E-retailers displaying superior transformation outcomes should likewise display superior E-commerce value creation outcomes. A secondary question concerns clusters

within the *Marketspace* model, and the extent to which particular clusters also demonstrate a relationship with E-commerce value creation outcomes.

These questions are relevant, because all firms must decide the extent of their commitment to E-commerce. Will greater commitment to online involving higher degrees of transformation and greater capital and re-current costs generate an appropriate return on investment? Alternatively, *ceteris paribus*, is such commitment unlikely to pay off in terms of return on investment?

Chapter Five, the *Research Methods and Design*, describes the methods and procedures employed to construct the instruments used to test for an association between superior transformation and E-commerce value creation outcomes, and to address the other RQs. The methods of theory based data analysis (Aneshensel, 2002) are used to explore the nature and significance of Cyber transformation theory. Theory based data analysis conceives of the development of theory as a process in which deductive reasoning, observation and inductive reasoning are employed to develop and extend theory. Another method, known as Social Network Analysis (SNA) (Scott, 1991; Breiger, 2004) is used to investigate information and knowledge exchange in the portal adopter group. The remainder of the Chapter describes procedures in instrument construction, the research plan and limitations of the proposed research.

Chapter Six, the *Pilot Study*, details outcomes from testing the various instruments and describes changes made to enhance measurement reliability.

Chapter Seven, the *Data Analysis and Interpretation: Adoption Survey and Site Evaluation*, describes the results of the firm and site survey components of the investigation outlined in Chapter Four. Data analysis is performed according to the methods of descriptive and inferential statistical investigation employing data sets captured in Microsoft Excel and SPSS. This chapter does

not attempt to attribute meaning to experimental outcomes, but rather to report them.

Chapter Eight, the *Data Analysis and Interpretation: Portal Experiment*, reports the results of web log analysis and analysis of qualitative and *sociometric* data collected as a consequence of the third component of the design, namely, the portal-quasi experiment. It also reports the results of SNA of information and knowledge flows that existed between firms in the portal group.

Chapter Nine, the *Conclusion*, explores the significance and meaning of the results reported in chapters seven and eight. It also suggests limitations of the current research and provides guidance on the conduct of further study.

The remainder of the thesis comprises a list of *References* and *Appendices* describing the various instruments used including the *B2C Cyber transformation Scale* and *E-commerce Adoption Survey*.

## 2 Literature review: E-commerce Adoption

This thesis investigates business transformation on the Internet through the lens of *Cyber transformation theory*. In a triangulatory research design, the thesis employs survey and quasi-experimental methods to explore association between Cyber transformation outcomes and E-commerce value creation outcomes in Australian Ecotourism, an industry/sector with transformation and E-commerce value potential. An extensive literature exists in relation to these matters.

The review begins with an exploration of recent research into CSFs in doing business online (see section 2.1). This section is organized thematically. A discussion of the research agenda for E-commerce adoption in Australia's Small-to-Medium Sized Tourism Enterprises (SMTEs) follows (see section 2.2). In this section, CSFs introduced in section 2.1 are contextualized in terms of the research literature on SMTE E-commerce adoption. An evaluation of two competing theoretical frameworks for understanding E-commerce adoption follows this discussion (see section 2.3). The first framework evaluated, E-mica, was devised by Burgess *et al.* (2001), as an explanation for E-commerce adoption in the Australian tourism industry. The second, Cyber transformation theory and the Marketspace model, comprises a generic framework devised by Dutta and Segev (2001). The evaluation scrutinizes the models, canvasses alternative theories for understanding E-commerce adoption and describes a research agenda for Cyber transformation arising from the limitations of existing research. Section 2.4 explores the research agenda in E-commerce value creation through an examination of the literature on financial success and other metrics used to measure E-commerce value. Section 2.5 describes findings from the literature review that shape this investigation.

## 2.1 The Research Agenda on E-commerce adoption

The agenda that bears upon the problems set for investigation in this thesis concerns E-commerce adoption drivers, CSFs and E-commerce value creation. An alternative to the analysis provided by the (CSF) literature may be found in a number of theoretical frameworks, some stressing evolution as a way of understanding E-commerce adoption, and some process integration or alignment or strategy. Two of these frameworks, E-mica and Cyber transformation theory are discussed in detail in Section 2.3

### 2.1.1 E-commerce adoption drivers and CSFs

As experience with Internet E-commerce accumulated in the 1990s, it was observed that increasing levels of E-commerce activity in firms did not always correlate with Return on Investment (ROI) and enhanced profitability. Consequently, serious academic investigation of CSFs in E-commerce adoption began. The *dot.com* meltdown of December, 2000 which saw the demise of many Internet firms provided a further stimulus to research.

How do 'bricks and mortar' firms make a successful transition to the online world, the so-called world of 'clicks and mortar'? There is a voluminous literature on E-commerce adoption and adoption drivers. The following themes are represented in the literature:

- Revolution and Counter Revolution (Small, 2000; Raisinghani, 2000; Gascoyne, 1997; Fenty, 2002, Porter, 2001);
- Early adopter and natural advantage (Enders and Jelassi, 2000; Mellahi and Johnson, 2000; De Figuerdo, 2000; Savin and Silberg, 2000);
- Product fit (Golden, Hughes and Gallagher, 2003; Peterson *et al.* 1997);

- Strategy (Golden, Hughes and Gallagher, 2003; Evans and Wurster, 1999; Straub and Klein, 2001; Dutta and Segev, 2001);
- Co-operation and collaboration (Ward, 1999; Maynard, 1999, Gartner Group, 1999; Holsapple and Singh, 2000; Rowe, 2004);
- Management and resources (Hogue, 2002; Burn, 1997; Henderson & Venkatraman, 1993; Wernerfelt, 1984, Barney, 1991, Zhu and Kraemer, 2002, Lucas, 2002; Zhu, 2004);
- Online community (Barua *et al.* 2001; Chaudury *et al.* 2001; Rothaermel and Sugiyama 2001; Yoo, Suh and Lee, 2002; Malhotra, 2002); and
- Social networks (Rogers, 1995; Wakolbinger and Nagumey, 2004; Rowe, 2004)

### 2.1.2 E-commerce as a revolution

The arrival of the World Wide Web in the 1990s transformed user experience of the Internet and created the potential for an unprecedented global E-commerce marketplace. As the telegraph in the nineteenth century had initiated a control revolution (Beniger, 1986) that changed the character of capitalism, the Internet and World Wide Web promised accelerated globalization of economic activity in which advantages of scale, resources and local market dominance enjoyed by firms could be swept away. The implications for doing business seemed revolutionary. In a *revolutionary* world, conventional wisdom is turned on its head (Small, 2000, p.19):

The new rules which apply in the digital world of communications and E-commerce are sometimes the exact opposite of the proven and accepted dogmas which apply in the conventional world.

The revolution is brought about because E-business and E-commerce environments (*ibid*, p.321):

exhibit all the symptoms of unstable chaotic systems. These conditions are totally different from the evolved maturity found in most business and commercial environments of the pre-Internet world of bricks and mortar.

This view is shared by Raisinghani (2000, p.4) who argues that companies face a “new competitive landscape” in which:

Firms exist in highly turbulent and often chaotic environments that produce disorder, disequilibrium and significant uncertainty, as well as continuous change.

According to Small (*op. cit.*, p.322), only when a firm learns to ‘think like an E-business’, can it evolve a successful online business strategy and model. The *cognitive style* of a firm’s decision-making about its Web strategy is crucial. Many businesses fail to make a successful transition to E-commerce because of a cognitive mismatch between industrial age thinking and the kind of thinking required to succeed in the chaotic business environment of the Web. Small comments (*ibid*, p.322):

Industrial Age business and commercial strategies were based largely on organization and control. Complexity was dealt with by creating structured and well-ordered frameworks within which reasonably accurate predictions could be made. These frameworks provided for logical and rational decision making. All of this goes out of the window when a chaotic environment is encountered. The methods and techniques which have proved to be so successful in dealing with the mass markets of the industrial age are found to be unsuited in digital communication environments.

Gascoyne (1997; cited in Raisinghani, 2000, p.4) takes the issue of a mismatch further, arguing for a new E-commerce organizational model. According to Gascoyne, the characteristics of the E-commerce organization are often opposite to those of an ‘industrial era’ organization (see Figure 2.1):

The E-business Model		
Characteristics	Old Model (Industrial Era)	New Model (Information/Knowledge Era)
Structure	Hierarchical	Integrated, Team based
Creativity	Largely undervalued	Must be nurtured
Orientation	Internal	External
Management gap/difference of perception between levels of management	Large	Small
Learning, experimenting and creativeness	Important	Essential
Group relationships	Vertically aligned teams	Integrated teams centered around the customer
Virtual corporation acceptance	Downsizing and right sizing	Forming strategic organizational alliances and linking of global core competencies
Primary business organization goal	Dominance	Able to act and adapt quickly
Key success factors	Streamlined and matured internal structure, tight well organized internal procedures	Change company behaviour, change reward structure, externally focused.

**Figure 2.1 The E-commerce Organizational Model (Raisinghani, 2001, p.4)**

In the writings of Small (2000) and contemporaries such as Raisinghani (2000) and Gascoyne (1997), a CSF can be found in the abandonment of industrial era thinking in favour of a new paradigm grounded in the information/knowledge era which has grown up around pervasive computer networking.

### 2.1.3 E-commerce: The counter revolution

The revolutionary view proclaimed E-commerce was an unprecedented phenomenon in commerce. In the wake of the collapse of Internet stocks known as *dot.com*, the idea that succeeding at E-commerce involves a fundamental shift from the world of traditional business came under sustained attack.



In 2001, Michael Porter in the influential *Harvard Business Review* declared:

“In our quest to see how the Internet is different, we have failed to see how the Internet is the same. While a new means of conducting business has become available, the fundamentals of competition remain unchanged. The next stage of the Internet’s evolution will involve a shift in thinking from e-business to business, from e-strategy to strategy. Only by integrating the Internet into overall strategy will this powerful new technology become an equally powerful force for competitive advantage”

(Porter, 2001, p.78)

In a recent PhD Thesis on critical success factors, Tennille Fenty (2002, p.xv) declares the manifesto of the *counter revolution* in the following terms:

By searching to define the unique nature of the Internet, you fail to see that the fundamental rules have remained unchanged- many critical success factors are the same across business models. The critical success factors for dotcoms involve having a product that is suitable for the Web and integrating traditional business practices, while for bricks-and-clicks should focus on the e-change process and technology.

Hoffman and Novak (2001, p.3) adopt a similar view, tempered by a need to address the unique characteristics of the Internet:

One mistake that the dot.coms made in the 1990’s was equating the fact that the Internet was different, with the erroneous, if not arrogant assumption, that it changes everything. Yet even if the fundamentals of what it takes to succeed in business have not altered, the Internet does have unique characteristics that must be acknowledged and addressed in any business strategy going forward.

The counter revolution is clearly seen in the re-assertion of old-economy metrics as the basis for measuring E-commerce value creation and the re-assertion of mainstream management theory about information systems adoption (including strategic alignment theory). These ideas, together with the notions of the importance of *product fit* and *natural advantage* form the basis of the following discussion.

#### 2.1.4 Early adopter and natural advantage

Contemporaneous with the revolutionary view, studies emerged that showed the importance of an idea inherited from innovation studies more generally, namely, the idea of the first mover or *earlier adopter advantage*. Enders and

Jelassi (2000) and Mellahi and Johnson (2000) are flag bearers for early adopter advantage. De Figuerdo (2000) claims to have found proof of early adopter advantage in the fact that such websites displayed greater 'stickiness'.<sup>6</sup> But these findings contrasted with other studies (Golder & Tellis, 1993; Kerin *et al.* 1992) that contradicted the popular wisdom of early adopter advantage.

By 2000, commentators (Bhatnagar, Misra and Rao, 2000; Mellahi and Johnson, 2000 and Savin and Silberg, 2000) were finding that *natural advantages* accrued to firms with strong Information and Communications Technology (ICT) foundations and, particularly, firms involved in computer software, computer hardware and telecommunications. In 2001, Lee and Runge refined this argument, claiming that SMEs that evaluated their IT adoption and investments were better equipped to exploit E-commerce. The work of Barua, Konana and Yin (2001b) can also be described as supportive of the idea of ICT natural advantage.

In a survey of some 4,500 US firms, these researchers found four key IT drivers, namely, systems integration, customer IT orientation, supplier IT orientation and internal orientation of IT applications which were positively correlated with E-commerce value outcomes (Barua, Konana and Yin, 2001b, p.35). The increasing online success of major computer companies such as Microsoft, Apple, Adobe, Macromedia and Dell Computer provided ready confirmation of ICT natural advantage hypothesis. However, the success of Amazon.com, which specialized in book retailing, and the online auction house Ebay, broke with the mould. Perhaps success online could be better explained in terms of product fit?

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<sup>6</sup> The property of a web site that concerns the duration of time spent by users on the site and the extent to which it attracts repeat visits.

#### 2.1.5 Product fit

Product fit (Kiang *et al.* 2000) holds that the characteristics of some goods and services are better suited to E-retailing than others. Golden, Hughes and Gallagher (2003, p.4) cite work by *The Economist* showing that goods can be classified as 'low touch' or 'high touch'. Low touch goods are those that are not dependent upon consumer sight and touch for attraction and decision. Items such as books, compact disks, software or computers are examples of 'low touch' goods. Low touch goods are suited to the Internet channel where the experience of touch can only be simulated in a virtual reality environment.

High touch goods demand authentic sight and touch for persuasion and, hence, are unsuited to the Internet channel. Peterson *et al.* (1997) (cited by Golden, Hughes and Gallagher, 2003, p.4) explain the phenomenon of product fit differently in terms of the dimensions of *cost and frequency of purchase, value and differentiation*, but arrive at essentially the same conclusion, that some goods exhibit product fit better than others.

In their own survey of online retailing, Golden, Hughes and Gallagher (2003, p.10) could show "no statistical significance between any of the characteristics of the products being sold online and the measures of success."

Thus, on product fit, the literature is contradictory in its findings.

#### 2.1.6 The role of strategy

Golden, Hughes and Gallagher (2003, p.8) were able to demonstrate in relation to two measures of E-commerce success (namely, site hits and leads generated) that online business *strategy* appeared to be strongly correlated with E-commerce success. However, there are many takes on strategy and its significance in E-commerce adoption. Evans and Wurster (1999, p.65) stress that E-commerce adoption requires "a fundamental re-think of traditional strategy and business models". Likewise, Small (*op. cit.*, p.94) emphasizes the

importance of the strategy domain in transition to the E-commerce environment. Success requires the 'cannibalizing' of:

techniques and methods used in the industrial age to extract key elements that can be used to create new strategies for the Information Age.

According to Small (*op. cit.*, p.235), well conceived strategy is based on understanding of the importance of game theory and tactics for tapping into the self-organizing nature of the Internet. Harmon, Rosen and Guttman (2001, p.45) argue that the main focus of E-strategy should be on the creation of new value propositions.

A progression school in E-strategy is espoused by Detmar Straub and Richard Klein (2001, p.3) who see sustainable advantage to firms in E-commerce adoption arising from progression through stages of strategy involving increasing sophistication:

Our research shows that successful integration of E-commerce occurs when firms progress through three levels. First-order initiatives at the alpha effect level are generally E-commerce endeavors aimed at realizing financial gain. Investments are geared toward increasing productivity and/or reducing production costs. Within this set of activities, E-commerce technologies are seen solely as a means of improving the bottom line. Such initiatives have met with both success and failure, and often lead to additional unexpected and unforeseen impacts.

In contrast, second-order effects at the beta level involving the pursuit of new markets and increasing the existing revenue streams often become the main thrust of a firm's E-commerce activities. Through new kinds of branding, firms can expand their business reach into new markets by providing 24/7 worldwide access to products and services through the Net.

Ultimately, third-order effects from omega activities lead inevitably to firms transforming their core business strategies in the interest of achieving a sustainable competitive advantage, or what we call omega-level e-competitive transformation.

Full implementation of an E-competitive transformation comes with "the complete integration of E-commerce into the firm's overall business strategies". (*ibid*, p.4)

Straub and Klein's (2001) framing of E-commerce adoption as a progression or evolution through stages is also taken up by Burgess, Cooper and Alcock (2001) in their *Extended Model of Internet Commerce Adoption (eMICA)*. This model is discussed in the following section.

Within their *Marketspace* theoretical framework, Soumitra Dutta and Arie Segev (2001) lend their support to the importance of E-strategy as a CSF. In a survey of web sites owned by Fortune Five Hundred companies, Dutta and Segev (2001, p.18) found that two thirds of surveyed firms were "simply treating the Internet as a publishing medium" and that very few firms had evolved *Cyber strategy* aimed at "actively using the Internet for launching new business models."

However, as discussed in *Chapter One*, Dutta and Segev (2001) offer a theoretical framework for business transformation based on the idea of the market space. Although they share enthusiasm for Cyber strategy with these theorists, Straub & Klein (2001) offer a notion of *E-competitive transformation* as a tertiary stage of E-commerce adoption. The attributes of this phase involve many of the ideas found in Dutta and Segev's (2001) work, such as the primacy of customer relationships and the building of virtual community. A notable addition, however, is to be found in the exploitation of *information asymmetry* (Straub & Klein, 2001; Tassabehji, 2003), where firms can derive sustainable advantage from information harvesting of customer information via the Web. Exploitation of information asymmetry is at the heart of tertiary or 'omega' phase E-competitive transformation:

To prosper in marketspace, companies must plan for an e-competitive transformation of their strategic business objectives. The emerging business model must go beyond alpha and beta changes to an omega order-of-magnitude transformation. Those that grasp this concept will quickly lock in cost reductions and revenue enhancement efforts, then push on rapidly to sustainable competitive transformation. In doing so, they will refocus their core competencies on customer relations, leading to massive information asymmetries with competitors.

Exponents of E-strategy as a CSF share a common belief that the principal cause of failure online is the transport of existing business models to online mode. In order to succeed, firms must develop a distinctively Cyber strategy, based on Cyber transformation of business models. The literature is not unanimous on the nature of the strategy prescription, but common threads exist particularly in relation to the customer relations potential of the Web and transformation involving the classic market space factors of *Price, Place, Product* and *Promotion*.

Unlike product fit, agreement exists in the literature regarding the nature and importance of strategy for doing business online. The incidence of E-strategy adoption in SMEs, however, appears disappointingly low, with Golden *et al.* (2003) finding around one half of firms have a strategy in place and Korchak and Rodman (2001), finding only one third.

#### *2.1.7 The role of Co-operation and emergence C-Commerce*

Game theory, externalities in the operation of online markets and bricks and mortar thinking about the importance of collaboration provide the conceptual foundations of another take on online strategy, Co-operative Commerce (C-commerce) (Ward, 1999; Maynard, 1999, GartnerGroup, 1999; Rowe, 2004). Regarded by Rowe (2004, p.263) as the successor to E-commerce, C-commerce is not restricted to trading, but encompasses other forms of information exchange. Holsapple and Singh (2000, p.155) adopt an expansive view of C-commerce:

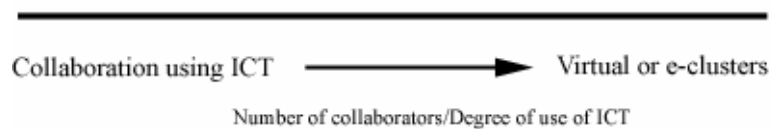
Using collaborative tools, components and integration technologies, c-commerce is concerned with information exchanges that pervade *all* collaborative activities in a community of participants.

Li and Du (2005, p.2005) also offer a technology centric view of collaborative commerce:

Collaborative commerce is defined as using information technology to achieve a closer integration and a better management of business relationships among parties, including internal personnel, business partners, and customers.

According to Sheth (1996) and Wilson (1996), C-commerce involves a shift in focus from transactions and exchange to one of relationships between firms. While C-commerce may involve as few as two collaborators and comprise activities as humble as reciprocal linking of E-commerce Web sites, Gartner Group (1999) see the potential for 'virtual multicompany enterprises' and Brown and Lockett (2000, p.52) see the emergence of 'e-clusters' employing fully fledged inter-organisational systems.

Rowe (2004) proposes a continuum of C-commerce collaboration based on the number of collaborators and extent and use of ICT (Figure 2.2):



**Figure 2.2 C-commerce continuum (Rowe, 2004, p.364)**

According to Rowe (*ibid*, p.364), the advantages of C-commerce include:

- access to new markets;
- synergistic benefits arising from linkages with complementary SMEs;
- competitive advantage arising from virtual mass and strategic linkages; and
- new opportunities for value creation based on value creating partnerships.

In a survey of 300 businesses in 2002, Deloitte Research (cited Li and Du, 2005, p.2) reported that collaborative commerce has led to better business operation and information exchange and has provided a seventy percent rise in profitability for those companies that adopted the technology compared with those that did not integrate with their trading partners. The benefits of co-operation, community building, networking, partnering and alliances are themes taken up by McGrath and More (2002). In a 2002, Information Technology Online (ITOL) research report commissioned by the National Office of the Information Economy, McGrath and More concluded:

What we are witnessing in contemporary organisational life is the transformative opportunities wrought by technological changes, most recently through web-based technology and the Internet, shaking traditional foundations of organizing and the very nature of organisations. Within such a context, organisational relationships, especially collaboration, is a crucial issue. While we have seen a more than steady growth in collaborative activity around the globe over the past decade or so, developments in technology, and, particularly, in E-business seem to have escalated that growth.

(McGrath and More, 2002, p.1)

McGrath and More (2002, p.13) frame collaboration in the broadest sense involving arrangements spanning “informal partnerships, through to strategic alliances, to joint ventures and mergers.” (McGrath and More, 2002, p.13)

In other research, Lucas (2002), Rowe (2004) and Waslon (2004) describe some of the consequences for competitive advantage arising from inability of firms to join forces to create critical mass. Lucas (2002, p.10) sees the quest to succeed at E-commerce as quest to secure ‘resource advantage’ – a strategic online resource that is inimitable and not easily duplicated by competitors.<sup>7</sup> Other research (NOIE, 2003) shows that the cost of database integration, the basis of resource advantage, is problematic for micro and small, businesses.

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<sup>7</sup> According to Lucas (2002, p.9), online reservations systems employed by airlines are classic examples of a *strategic resource advantage*.



However, according to Tettah and Burn (2001, p.171), realization of the benefits of C-commerce requires a fresh approach to strategy. Like Small (2000), these authors argue for a revolutionary approach to strategic planning and management, that emphasizes trust and “a realization of the importance of co-opting, rather than competition which typically exists between firms” (*ibid*). Rowe (2004, p.369) finds that whilst there are many advantages and benefits from collaboration using IT, these benefits have not been realized by Australian SMEs. She describes a research agenda for ‘C-commerce readiness’ encompassing strategic predisposition, firm maturity, market externalities and cultural issues and environmental factors.

Rowe’s (2004) work is illustrative of an emerging research literature on CSFs in C-commerce adoption. The competition theorist, Porter (2000) has suggested that successful local cluster development in a global economy depends upon factor conditions that include:

- context for firm strategy and rivalry inside the cluster, such as competition and collaboration that put pressure on productivity;
- demand conditions, such as level of sophistication and demand of consumers;
- related and supporting industries, such as supporting suppliers and ancillary industry; and
- factor conditions, such as availability of infrastructure, skills and capital.

In the Porter model, interaction between these factors, or pressure from competition or consumers, can put pressure on productivity the leads to cluster innovation. In work that anticipates later discussion in the review of the role of social networks in E-commerce and C-commerce innovation, Porter (1998) also acknowledges a gap in the cluster literature concerning ‘social

structures', which it is argued may be more important for SMEs than in the case of mature enterprise.

The introduction of C-commerce to an existing network represents an innovation stimulus, hence mainstream innovation theory (Rogers, 1995) is potentially applicable to the analysis of CSFs in SME C-commerce adoption. In his Diffusion of Innovation (DOI) Theory, Rogers (1995) identified a number of *endogenous* factors at work in any innovation context, including (Rogers, 1995, p.216):

- relative advantage over alternatives;
- compatibility with existing values,
- experiences and needs;
- complexity;
- trialability; and
- observability of the innovation.

The innovation research literature also suggests a number of predominantly *exogenous* or environmental factors such as industry, marketplace, culture, and government and industry regulatory conditions (Chengalur-Smith & Duchessi 1999; Kwon & Zmud 1987; Swanson 1994; Yang *et al.* 2004).

An emerging tourism specific research literature exists that contextualizes this discussion of barriers, drivers and benefits of C-commerce. This literature is discussed in section 2.2.

#### 2.1.8 The role of management and resources

The role of strategy points to more expansive thinking on the role of management in E-commerce adoption. Gascoyne's (1997; cited Raisinghani,

2000, p.4) work on *The E-commerce Organization Model* is illustrative of this thinking. In an approach comprehensive of the panoply of management issues that businesses face with technology, Hogue (2002) develops a concept of *Business Technology Management* (BTM). According to Hogue (2002, p.232) companies must secure an alignment in three key areas, *business, process, and technology* in order to succeed in E-commerce.

In order to understand, communicate, and plan how they should utilize technology in the enterprise, companies first need to align three key areas—business, process, and technology. But to achieve alignment among these areas requires a fundamentally different approach than those used before—one that brings these disciplines together in a way that all can understand. This approach creates unprecedented visibility into how business and technology decisions are made, and provides the means for tracing decisions back and forth between the two, so that companies can discover and communicate interdependencies. This approach is called *Business Technology Management*, or BTM.

Where alignment does not exist, conditions of disconnect prevail, providing the context for failure. Fixing this disconnect involves adopting the principles of BTM including:

- \*predictive modeling, which allows project teams to create blueprints that improve design decisions and facilitate alignment;
- \*collaborative decision-making, which includes a broad range of stakeholders to make sure that competing needs are balanced; and
- \*making knowledge and assets reusable, which maximizes the value of both intellectual and physical capital.

(*ibid*, p.233)

The bursting of the *dot.com* bubble ushered in an era of renewed interest in business management of information technology and the so-called ‘business/technology disconnect’. While the terminology may be new, this kind of thinking has its genesis in an idea, from the 1990s (Burn, 1997; Henderson & Venkatraman, 1993), namely, that Information Systems strategy needs to be strategically aligned with business strategy. It also has origins in Wernerfelt’s (1984) *Resource Based View* (RBV) of the firm.

BTM's emphasis on alignment of business, process and technology sits comfortably with RBV's conclusions about the business value of information technology, namely, (Zhu, 2004, p.176) that "IT payoffs depend on fitting the pieces together- that is exploiting the relationships between complementary resources." RBV links firm performance to organizational resources and capabilities (Wernerfelt, 1984, Barney, 1991, Zhu and Kraemer, 2002, Lucas, 2002; Zhu, 2004).

According to Zhu (2004, p.176):

Viewed from a resource based perspective, it is how firms leverage their investments in IT and E-commerce to create unique Internet enabled capabilities that determine a firms overall E-commerce effectiveness.

Optimally, if the right Internet enabled capabilities are produced, a condition of 'resource advantage' emerges for the firm (Lucas, 2002; Straub and Klein, 2001; Affuah and Tucci, 2001) encompassing a strategic online resource that is inimitable and not easily duplicated by competitors.

#### 2.1.9 *The role of community*

Many E-retailers have constructed virtual communities as a means of promoting brand identification and enhancing customer relationships. The term *virtual community* was coined by Howard Rheingold in 1993. Rheingold defined virtual community as:

A social aggregation that emerges on the net when enough people carry on long enough, with sufficient human feeling to form webs of personal relationship in Cyberspace.

(Rheingold, 1993, p.9)

There is widespread agreement in the literature that a strategic approach to the construction of virtual communities will pay off in terms of E-commerce outcomes. Computer hardware and software vendors such as Microsoft, Dell, Cisco and Apple provide case study support:

As in other areas of operational excellence, Cisco Systems and Dell Computer Corp. lead online customer-service efforts. Their Web sites offer comprehensive repositories of information, online communities in which people help one another, and interactive features that allow customers to help themselves.

(Barua *et al.* 2001a, p.38)

Catherine Ridings (2000, p.xv) in a PhD on *Determinants of trust and use in virtual communities* claims that virtual communities have become:

a hot topic in the popular press and MIS research. Community sites are one of the fastest growing categories of Web-sites, and the virtual communities themselves are growing. Understanding virtual communities is crucial to organizations that want to tap into their enormous information potential.

By sponsoring and cultivating virtual communities that give customers the ability to interact with each other and with the company itself, businesses can build new and deeper relationships with customers. Businesses can obtain demographic information about their target market and likes and dislikes regarding products.

Barua *et al.* (2001a) see the nurturing of online communities as an important factor in E-commerce operational excellence and success. Chaudury *et al.* (2001, p.101) are likewise impressed by the contribution that online communities can make to E-commerce activity:

A successful example is that of Cisco, which is reportedly saving over one-half billion dollars a year by providing customer assistance over the Web. It encourages its users to interact over their Web site and meet each other needs ([www.cisco.com](http://www.cisco.com)). The use of Web-based arrangements to allow customers to support each other is not only a good public relations move, but also takes a considerable load off the company's support staff. By providing users and developers' communities with information and contacts, it builds loyalty for its brand name while promoting collaboration among its customers.

Frank Rothaermel and Stephen Sugiyama (2001 p.297) claim that:

An effectively managed virtual community provides economic gains to the community organizer and to its members. A member's off-site communication, experience, perceived value of site management, content, and collectively held knowledge are positively associated with a member's e-based economic transactions within this virtual community.

They also claim to have observed a positive correlation between community participation and firm profitability in a case study of TimeZone.com<sup>8</sup>, an online community of devoted wristwatch enthusiasts and hobbyists (*ibid*, p.297). However, Rothaermal and Sugiyama do not regard participation in a community as a sufficient condition for enhanced profitability, rather they conclude that “size, scalability and site management” relate to commercial success (*ibid*, p.297).

Much of the literature discussed above is based on research that pre-dates the *dot.com* meltdown and is grounded in optimism about the potential of virtual communities. But recent publication continues to assert the importance of virtual communities as an element of E-strategy. For example, in a study that explores strategies for promoting virtual community participation, Yoo, Suh and Lee (2002, p.56) declare that [virtual] communities are one of the “three most important factors, along with content and commerce, that compose E-business.” They claim three explanations for the importance of online communities in the Internet era: namely,

- tapping of new markets;
- enhancing customer loyalty to a brand; and
- provision of a human dimension to the online experience.

According to Yoo, Suh and Lee (2002, p.56) US companies invested over \$300 million in the construction of online communities in 1999. Yogesh Malhotra (2002, p.1) argues that:

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<sup>8</sup> TimeZone (2003). *TimeZone.com: The World's Leading Watchmaking Resource*. Retrieved 9 February, 2003 from <http://timezone.com/>

The role of online communities has become increasingly important to the success of E-business. The E-business enterprise's capability for creativity and ability to leverage the community will determine if it loses or wins in the "market-space." Commercial success in E-business depends on organizing and exploiting the potential of virtual communities. Their key argument is based on the premise that the knowledge, content, and resources produced by online communities are extremely valuable commodities.

In the tourism domain, Corigliano and Baggio (2003) conducted an empirical study of Italian tourist web sites, finding that sites with higher community index rankings recorded more pages viewed and 140% more unique visitors than sites with minimal or no use of community features. This finding endorsed earlier work by Dellaert (1999) pointing to the significance of virtual community in marketing tourist destinations and services.

Thus, the literature on virtual community both before and after *dot.com* emphasizes its importance as an element of E-strategy for E-retailing.

#### *2.1.10 Social and knowledge networks*

Discussion of the research literature on C-commerce pointed to the role of social factors in successful clustering (Rowe, 2003; Porter, 1998). Social interaction and community also feature in the supply side CSF research literature as factors shaping diffusion of economically significant innovation. In 1991, Freeman found that the innovation process in firms to be one of a complex network of interaction, that included not just cost benefits, but strategic behaviour, appropriation of knowledge, technological complementarity and *sociological compatibility* (Freeman, 1991, p.548). In 1995, as part of his Diffusion of Innovation (DOI) theory, Rogers argued that in the information network of the organization, managerial champions and opinion leaders could affect organizational acceptance and the velocity of adoption of innovation. In 1996, Uzzi (1996, p.674) declared a "growing need to understand how social structure assists or impedes economic performance." Thus, work by Uzzi (1996), Rogers (1995) and Freeman (1991) suggested the role of social networks and nodes within networks in shaping economic

performance and response to innovation. However, the application of social network theory to the understanding of E-commerce adoption has been slow to emerge.

Recent work in social network analysis and frameworks includes works by Freeman (2000), Krackhardt (2000) and Carley (2004), but the field is much older. In 1857, Marx (1956, p.96) argued that “society is not merely an aggregate of individuals; it is the sum of the relations in which individuals stand to one another.” The pioneer nineteenth century sociologist, Durkheim (1965, p.38) in a critique of the work of Montesquieu argued that what is “essential is not the number of persons subject to the same authority, but the number bound by some form of relationship.” These ideas were taken up by the English anthropologists Radcliffe and Brown (1940) who concluded that human beings are connected by a complex network of social relations.

Social network theory is multi-disciplinary, drawing upon ideas from anthropology, sociology, data communications and social psychology. Social network theory inherits terminology and constructs from these disciplines. One perspective (Hothenthwiate, 1999; Boudourides; 2002) holds that a social network is a set of *actors* and the *relations* that hold them together:

*Actors* can be individual people, or they can be aggregate units, such as departments, organizations, or families. The key is that the actors exchange resources which then connect them in a social network. Resources may include data, information, goods and services, social support, or financial support. Each kind of resource exchange is considered a social network *relation*, and individuals who maintain the relation are said to maintain a tie. The strength of their tie may range from weak to strong depending on the number and types of resources they exchange, the frequency of exchanges, and the intimacy of the exchanges between them.

Grounded in an alternative view derivative of computing and data communications, Ethier (2004, p.1) conceives of a social network as “a set of objects, or *nodes*, and a mapping or description of the relationship between the objects. A core task in analysis therefore is the mapping of relationships between these *nodes*”. In this way social network theory aims to develop



understandings of the 'social capital' of individuals. According to Kadushin (2003, p.1) social capital refers to the "network position of the object or node and consists of the ability to draw on the resources contained by members of the network." The social capital of a node is not only determined by immediate or neighbourhood mappings, but also by the mappings of nodes further removed from the original node. Knowledge, influence and power increase with nodal connections and mappings. Social network theory can be used to explain opinion formation in social groups and to analyse collective behaviour.

In a ground breaking study, Wakolbinger and Nagumey (2004) applied social network theory to the analysis of buyer-seller relationships in E-commerce supply chains. However, social network research in E-commerce adoption is in its infancy, leading Braun (2003, p.5) to comment that "the diffusion of innovations literature does not generally untangle the effects of the embedded network structure on the diffusion process." In the nurturing of C-commerce networks, the roles played by social network topology analysis and social network engineering as CSFs form priority areas for further research.

Freeman's (1991) view about the importance knowledge appropriation in the innovation process in firms has given rise to an alternative network based CSF theory known as knowledge networking (Apostolou *et al.* 2005). In C-commerce adoption, knowledge network theory claims to have initiated a new paradigm for collaborative business "by forging links between internal and external knowledge and information sources" (*ibid*, p.183):

The overall aim is to classify and review various approaches to interorganizational knowledge networking whose objectives may span a multitude of needs from 'loose' information sharing that may not be connected to financial transactions between the networking organizations to 'tight' knowledge exchanges that are related to commercial transactions and enable the creation of value from leveraging the interchange of knowledge assets.

(*ibid.*)

Knowledge networking for C-commerce has its origins in knowledge management (Alavi & Leidner, 1999; Davenport & Prusak, 1998; Nonaka, 1994; Nonaka & Takeuchi, 1995; Zack, 1999) and what Apostolou *et al.* (2005, p.184) argue is the increasing focus on cultivation and exploitation of knowledge chains as a source of innovation and competitive advantage. Braun (2002, p.43) argues that in the age of 'connectivity':

A fundamental shift in business models is occurring whereby information, knowledge and relationships underpin competitive relationships.

In SMEs, Keeble and Wilkinson (2000) argue that the need for access to local explicit and tacit knowledge networks is an important CSF in clustering. Apostolou, Mentzas and Maas (2005, p.188) assert the existence of *knowledge networks* consisting of "relationships among entities (individuals, teams, organizations) working on a common concern." The adaptation of social network theory to the problem of knowledge networks is a theme taken up by Borgatti and Cross (2003, p.433) who argue that a principal failing of research on organizational learning is a focus on:

Declarative (know-what) or procedural (know-how) knowledge, with little inquiry into organization learning as a function of relationships (know-who).

Social network theory is evolving as a bridge between established ideas about the importance of knowledge appropriation in the innovation process in firms (Freeman, 1991; Rogers, 1995; Uzzi, 1996) and the formal study in organizations of knowledge creation, acquisition, sharing and exploitation, activities that are identified with knowledge management. Borgatti and Cross (*ibid*) further argue that a social network perspective can "enrich our understanding of both dyadic and collective learning". The main thrust of this new approach should be to more than "simply measuring communication flows among network nodes" rather than "to model learned characteristics of relationships that underlie information seeking and sharing" (*ibid*). In an empirical study that focused on the kinds of relationships that influence

information seeking behaviour, Borgatti and Cross (ibid, p.439) found that appreciation of a person's *knowledge*, the *value* placed on this knowledge in the knowledge domain of the problem and the *accessibility* of the source were statistically significant determinants of information and knowledge seeking behaviour in a network:

“Our study offers evidence of at least three enduring relational characteristics that are predictive of the behaviour of information seeking: (1) knowing what another person knows, (2) valuing what that other person knows in relation to one's work; and (3) being able to gain timely access to that person's thinking.

(Borgatti and Cross, 2003, p.440)

While the work of Borgatti and Cross (2003) emphasizes the importance of the ties of *knowledge*, the *value* placed upon this knowledge and its *accessibility* in discussion of the social aspects of learning, work by La Micela, Roberti and Jacucci (2003) provides domain specific SMTE case study evidence of the role of *trust*. In an Italian clustering project called the PICO Project, La Micela, Roberti and Jacucci (2003, p.95) had found that a specific training path had been required to facilitate “innovation and co-operation”. This training path built *trust* providing the basis for *commitment* and disseminated *knowledge* aimed at changing actors' parochial views. The wider literature on C-commerce adoption (Morgan and Hunt, 1994; Robbins, 2003; Rowe, 2004) also draws attention to the role played by trust and commitment in securing value from C-commerce initiatives.

## 2.2 The Research Agenda: E-commerce adoption in Australian Small-to-Medium Sized Tourism Enterprises (SMTEs)

Tourism comprises a service sector of the Australian economy dominated by small-to-medium sized tourism enterprise. In 2000, the Co-operative Research Centre for Sustainable Tourism estimated that between 90% and 95% of Australian tourism businesses comprised small businesses (CRC, 2000, p.6). The Australian Bureau of Statistics (ABS, 2002a, p.1) distinguishes sub-categories of SME type enterprises:

- micro businesses (comprising businesses employing less than 5 persons);
- small businesses (comprising businesses employing between 5 and 20 people); and
- medium sized businesses (comprising businesses employing between 20 and 200 employees).

The concept of the Small-to-Medium Sized Tourism Enterprise of SMTE (CRC 2000, p.3) has developed as industry specific short hand for Australian tourism SMEs.

The research literature on E-commerce adoption in Australia's SMTEs that bears upon this research includes:

- an established research literature that articulates the role of human capital, strategy, management, technology and resources as CSFs in E-commerce adoption;
- an emerging literature concerned with risks and opportunities arising from new technology platforms and C-commerce.

This thematic framework forms the basis of the discussion that follows.

#### *2.2.1 Research literature on SMTE E-commerce adoption: CSFs*

The extent to which Australian SMEs lag in the adoption of technology, including E-commerce, is the subject of a vital and expanding research literature (Bode & Walker 2003; Bode, 2004; Brown 2002, , Pease & Rowe 2003). In 2002, the Australian SME E-Commerce Forum Taskforce (Brown, 2002, p.4) identified 10 'issues', each encompassing one or more CSFs featuring in the broader literature:

- Leadership (Barry and Milner, 2002; Bode, Burn, and Webster, 2003);
- Awareness and Understanding/Access/Affordability (Mehrtens, Cragg, & Mills, 2001; Walker, Bode, Burn, and Webster, 2003);
- Security/Public Key Infrastructure (McKnight *et al.* 2002; Suh 2003);
- Privacy (Nowak and Phelps, 1997; Hoffman, Novak and Peralta, 1999b; Miyazaki and Fernandex, 2001; Vuori *et al.* 2004);
- Technology/Applications & Hardware/Software (Lewis and Cockrill, 2002; Walker, Bode, Burn, and Webster, 2003)
- Education and training in Technology and Management (Cragg and King, 1993; Darch and Lucas, 2002; Duan, Mullins, Hamblin, and Stanek, 2002);
- B2B/B2C Online trading and Payments (Horder, 2002);
- Business Analysis and Planning readiness (Chau, 2003; Scupola, 2002);
- Bandwidth, Demand Aggregation and Regional Issues (Nodder *et al.* 2003; Braun, 2003; NOIE, 2002) and
- Support, Assistance, Investment incentives and Tax issues (IBLS, 2003; Lau and Halkyad, 2003).

The SMTE specific literature develops and expands on many of these issues. For example, access to expertise, capital, and training, bandwidth and business strategy formation skills form recurring themes in the literature (Buhalis, 1996; Buhalis, 2003; Hull and Milne 2001; Nodder *et al.* 2003).

An expanding international literature also exists that is concerned with E-commerce adoption outcomes in SMTEs. In a descriptive study of the Italian tourism industry, employing a model of the online business space based on *customer relationship services*, *E-commerce functionalities* and *informational materials* and *general interactive services* and user evaluation, Corigliano and Baggio (2003) found low quality outcomes as typical, and involving a risk of disintermediation. According to these authors (*ibid*, p.87) if “traditional intermediaries do not offer valid web sites, the user is more tempted to turn to the main providers” and “relative poverty in terms of contents and services” generates directly a general distrust” with flow-on effects to DMOs (Destination Marketing Organizations) and whole destinations (*ibid*).

#### 2.2.2 Emerging literature on SMTE C-commerce adoption and Networking

Adding to discussion on the role of human capital, Nodder *et al.* (2003) and Wilson (2002) report cultural and resource impediments to the adoption of C-commerce in SMTEs. Endorsing an earlier finding of Wilson (2002), Nodder *et al.* (2003) report a culture of ‘stubborn self-sufficiency’ as typical of SMTE owner/operators. Coupled with resource issues and costs that go with commitment to networks and other collaborative activity, cultural resistance results in low levels of collaboration and a “lack of effective networking” (*ibid*, p.7). Porter (1998) addresses the role of networks in C-commerce directly, suggesting that ‘social structures’ may be more important for SMEs than for mature clusters.

Networking as a CSF theme is also taken up by Braun (2003). In a review of SMTE clustering for regional innovation, Braun (2003, p.4), found that while tourism showed more evidence of clustering at a regional level in Australia than other industries, many tourism SMTEs continued to operate in isolation. Citing Pavlovich (2003, p.547), Braun declared that firms excluding themselves from such linkages “may end up disadvantaged as such inter-firm

connections often result in market visibility and strategic leverage”. In action research, involving tourism operators in the Grampian Region Braun (2003, p.7), found that institutional actors “did not use the existing communication channels to transfer knowledge or act as change agents” and that:

In an environment of disconnected networks with no commitment to regional innovation and social learning, there was no perceived need for clustering or change. Contributing to weak network ties and the maintenance of a heterogeneous network culture were elements such as (poor access to) infrastructure; place (status and position of power) in the network; spatial make-up of the network (shire proximity to and affinity with the central icon); and individual actors’ strong identity with their own community. A systemically embedded culture of competition and autonomy identified in the industry further prevented virtual clustering from taking place.

Micela, Roberti and Jacuzzi (2002) emphasize the importance of training in securing C-commerce outcomes with SMTEs and that ICT innovation in-itself may be insufficient. Training must not only provide for acceptance of ICT innovation, but organizational and cultural change that goes with collaboration of shared online destination marketing initiatives. Li and Du (2005, p.15) expand the discussion on CSFs in C-commerce adoption to include:

- Relationship management- The ability to manage the resulting dynamic business relationship;
- Business process integration- The businesses processes of each partner must be clearly understood by every partner and processes must be decomposable into smaller components that lend themselves to integration;
- Knowledge and information sharing- It is important to have a superior information infrastructure to allow information and knowledge to be shared;

- Collaborative culture- Successful building of a collaborative atmosphere across organizations determines the success of collaborative commerce.

In a study of Italian eTourism, Molinaroli and Buhalis (2003, p.97) blend ideas of resource advantage, aggregation in the idea of 'Entrepreneurial networks':

Networks of economic "actors" and entrepreneurial activities aimed at create new resources or combining existing resources in new ways to develop new products and service new customers.

Barriers to technology adoption and E-competitiveness arising from firm size and independence of action in the Australian tourism marketplace are themes taken up by Australia's premier tourism research agency, CRC for Sustainable Tourism, in its 2000 technology scoping study, *Meeting the Challenge*. CRC (2000, p.23) argues that the medium term online future would belong to larger firms:

Small businesses run the risk of being further marginalised by large enterprises, which have the knowledge and resources to dominate the online marketplace. Additionally, they may be excluded from important information networks if they cannot resource the uptake of online technologies.

CRC for Sustainable Tourism concluded that SMTEs "appear to have the most to lose and the most to gain from online technologies" (CRC, 2000, p.23) and that a national action agenda based on the idea of 'sustainable uptake' should be pursued. Waslon (2004, p.19) sees a large numbers of independent SMTEs creating barriers to achieving 'co-opetition' or 'one view' for the consumer.

### 2.3 Theoretical frameworks for understanding E-commerce

As research has added to the numbers and kinds of CSF found to be important in E-commerce adoption, the quest to evolve theoretical frameworks that bring together CSFs has gathered momentum. Taken in isolation, the CSF specific literature displays weaknesses. For example, much CSF research depends on bivariate type analysis and, hence, CSF simplifies the operation of



a system. For example, early adopter or natural advantage determines whether a firm makes a successful transition to the world of E-commerce. Simple bivariate analysis is often unsuited to systems where factors such as antecedent and independent control variables work together to bring about covariation in the phenomenon being observed. A richer more realistic discourse is provided by theoretical frameworks that attempt to bring together the many factors that are supposed to be at work within a comprehensive theory. Two such frameworks are discussed in detail here: the *eMICA* model (see Figure 2.3) and the *Marketspace* model (see Figure 2.4). Both are grounded in an RBV approach to understanding E-commerce adoption (see section 2.1.8) and both frame E-commerce adoption as an evolutionary process. Each comprises comparatively recent publication.

Genesis of the evolutionary approach to framing E-commerce adoption can be found in work published by Little and Taylor (cited in Raisinghani, 2000, p.9) in 1996 that postulated a four stage 'e'volutionary framework:

- Stage One Companies digitize internal data in a publishing model without a significant impact on business processes.
- Stage Two Companies start thinking about re-engineering a part of their business process. Integration with backend systems begins with the goals of achieving flow through and a hands-off approach to particular processes.
- Stage Three Companies move into original content, which may be highly interactive. With the goal of one-to-one marketing, a company seeks to develop profiles of users accessing its sites so they can be treated uniquely.
- Stage Four Companies that are fully enabled seek to achieve dynamic segmentation, in addition to developing basic user

profiles. Specifically, segmentation of site visitors is done in real time, based on user activity.

The period of the middle to late 1990s was a fertile period in E-commerce research that spawned a number of other frameworks. Quelch and Klein (1996) performed a content analysis of Web sites and conceived a typology of functionality based on information support or transaction processing. Cappel and Myerscough (1996) developed a more detailed taxonomy based on the ideas of marketplace awareness, customer support, sales, advertising and information provision. Timmers (1998) moved the discussion forward in a study that identified eleven business models for E-commerce adoption including E-shop, E-procurement, E-auction, third-party marketplace, virtual community, value-chain provider, value-chain integrator, collaborative platforms and information brokerage. Ho's (1997) investigation developed a three dimensional matrix model to describe E-commerce adoption involving promotion, provision and processing and value creation for the customer.

The *eMica* and *Marketspace* frameworks discussed in detail in the work that follows display in the case of the former, an 'e'volutionary behavioural reinforcement approach to explaining E-commerce adoption, and in the case of the second, the importance of business strategy in explaining the same phenomenon. Each can be related in some way to earlier modeling efforts of the 1990s. Both have their genesis in empirical investigation of publicly accessible data sets (Business-to-Consumer Web sites) utilizing the methods of theory-based data analysis and scale instruments. Both operationalize business transformation in terms of measurable phenomena involving these data sets, a core issue for this study. Both can be related to RBV and the leveraging of IT and E-commerce capabilities to create Internet enabled capabilities that furnish the basis of competitive advantage (Straub and Klein, 2001; Lucas, 2002; Zhu, 2004). The question of which of these two frameworks offers the most promising ground for further investigation describes an

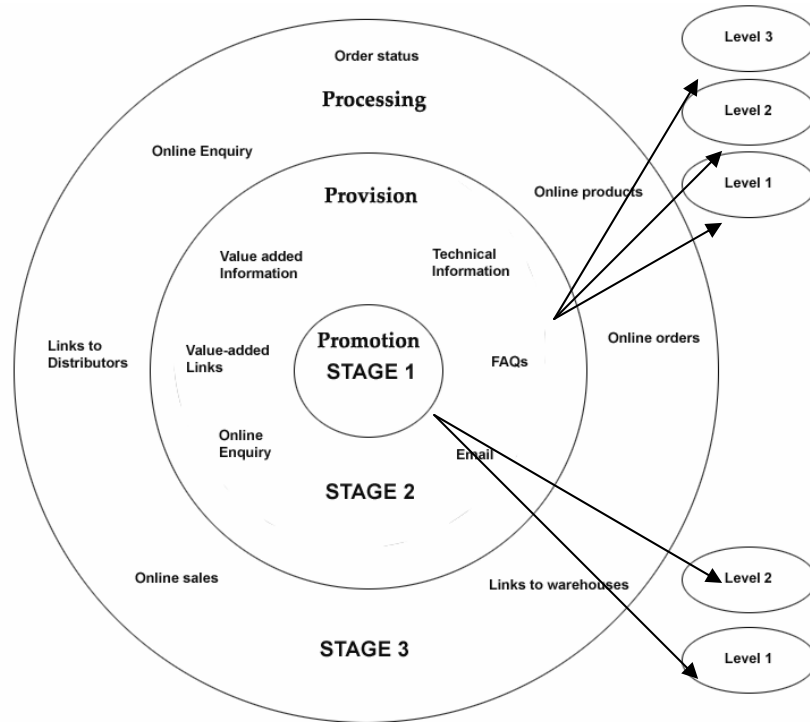
important task for the remainder of the review and sets the research agenda for the thesis.

### 2.3.1 eMICA: An evolutionary framework for tourism

In 2001, Burgess, Cooper and Alcock (2001) published their *Extended Model of Internet Commerce Adoption (eMICA)*. The model emerged from a theory based data analysis study of 188 Business-to-Consumer web sites in the Australian tourism industry. The *eMICA* model has its origins in progressivist thinking. Unlike the frameworks of Straub and Klein (2001) and Dutta and Segev (2001) which explain progression in terms of the application of strategy, Burgess, Cooper and Alcock's model (2001, p.3) explains progression in terms of *experience and behavioural reinforcement*:

eMICA is comprised of three stages, each of which consists of 'layers' of functionality. eMICA proposes that as firms become more familiar with and more confident in the value that can be derived from online business, layers of functionality are added to their website. This 'layering' takes place in stages, moving the website from simple static promotion to full fledged E-commerce applications.

Evolution is benchmarked in terms of levels of *functionality* in online activity involving increasing complexity and sophistication (see Figure 2.3):



**Figure 2.3 The Extended Model for E-commerce Adoption (eMica) Model ((Burgess, Cooper and Alcock, 2001, p.3)**

For Burgess, Cooper and Alcock (2001), like Straub and Klein (2001) and Dutta and Segev (2001), E-commerce adoption is best viewed as an evolutionary process involving increasing levels of functionality and complexity over time corresponding to the addition of value:

eMICA proposes that in developing commercial web sites, organizations 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... As sites move through the stages of development from inception (promotion), layers of complexity and functionality are added to the site. The addition of layers is synonymous with the business moving from a static Internet presence through to increasing levels of interactivity to a dynamic site incorporating value chain integration and innovative applications to add value through information management and rich functionality.

(*ibid*, p.3)

In summary, E-commerce adoption involves an evolutionary process of increasing business transformation as expertise and return on investment fuel organizational commitment to online activity.

Limitations of the Burgess *et al.* (2001) research concern its scope, its coarseness and assumptions that underpin the design. For example:

- the research assumes that increasing levels of business transformation pay off, but there are very few cases of Level 3 transformation identified.
- the research enables no conclusions about the *respective* importance of online functionality or transformation.
- the model assumes that functionality is the important thing and makes no provision for Usability or user centered design in explaining E-commerce adoption outcomes (the model is entirely transformation focused).
- the model omits important transformation criteria regarded by other researchers as important. Specifically, *discovery* is omitted, a surprising situation since by 2000 it had been established that just under two thirds of Internet users who used the Internet for destination planning used search engines (*vide* TIA, 2000).

### 2.3.2 Cyber transformation theory: An enriched business transformation framework

Dutta and Segev's (2001) Cyber transformation theory provides a richer explanation of E-commerce adoption than the Burgess *et al.* (2001) model by introducing an additional axis or dimension of transformation: a Technological Capability or *Interactivity and Connectivity axis*. A further refinement consists of the introduction of *customer relationships* as an element in the strategic business dimension (see Figure 1.2<sup>9</sup>). The Dutta and Segev

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<sup>9</sup> Vide Section 1.3, p.9.

model describes transformation criteria for business models that must be *satisfied* for Cyberspace. Transformation must be two dimensional involving:

- a *Technological Capability* dimension based on Interactivity and Connectivity; and
- a *Strategic Business* dimension constructed around the factors of products, prices, promotion and placement (recognizable as the four Ps of the traditional market model) and customer relations.

The significance of Dutta and Segev's (2001) work lies in its aggressive emphasis on E-strategy and business transformation as necessary conditions for successful transition to the online business domain and articulation of a dimensional model inclusive of systems, business strategy and customer relationships. It attempted to draw the results of various factor discrimination studies in E-commerce adoption into a theoretical framework. It also drew upon increasingly popular RBV (Westerfeld, 1984) thinking that linked IT value to a firm's ability to link IT infrastructure to E-commerce capabilities that were connected with firm performance. These capabilities were framed in terms of the *Marketspace*, a core element of traditional business theory and practice. But it arrived essentially too late to exercise much influence over business investment decisions and the cautionary message conveyed seemed hollow as the *dot.com* disaster unfolded in 2000. *Cyber transformation* and the *Marketspace model* share with the *Model of Internet Commerce Adoption (eMICA)* a common view of Internet commerce adoption as an evolutionary process involving increasing levels of business transformation over time. Whereas this process is fuelled by E-strategy in the *Marketspace* model, *eMica* sees this process in terms of behavioural reinforcement as businesses reap the rewards of increasing levels of sophistication.

### 2.3.3 Summary

The research agenda on E-commerce is broad in scope and, chronologically, mostly concentrated in the period up to the *dot.com* collapse of 2000, a period characterized by optimism about the 'new economy'. In terms of CSFs, there is a tendency for the literature to be contradictory in its findings. For example, the propositions that *early adopter advantage* and *product fit* are important, is contested. A more promising model of E-commerce adoption in the firm is supplied by theoretical frameworks such as Cooper and Burgess' (2000) *Model of Internet Commerce Adoption (eMICA)* and Dutta and Segev's (2001) *Theory of Cyber transformation*.

These frameworks have emerged from studies that have emphasized the importance of business transformation in E-commerce adoption and the Resource Based View (RBV) of the firm, which links IT and E-commerce infrastructure value to the creation of capabilities that confer competitive advantage. Grounded in the 1990s work of Timmers (1998), Ho (1997) and Little and Taylor (1996), business transformation theory remains important in discussion of E-commerce adoption. Of the two models selected for further investigation, the *Marketspace* model frames business transformation and progression in terms of the evolution of E-strategy, whereas the *eMica* model sees the same process as fuelled by behaviourism grounded in value. To date, neither model has been validated in terms of E-commerce value creation outcomes. For both models, higher level business transformation outcomes should be positively correlated with superior E-commerce value outcomes. Limitations of *E-mica* discussed in Section 2.3.1 and an emerging research literature on the importance of E-strategy in E-commerce adoption (Golden, Hughes and Gallagher, 2003; Evans and Wurster, 1999; Straub and Klein, 2001; Korchak and Rodman, 2001) suggest that Cyber transformation theory and the *Marketspace* model provide the firmest foundation for further research. However, both *eMica* and *Marketspace* are premised on the opportunities for

business transformation afforded by the Web. Both involve a progressive, evolutionary view and operationalize business transformation in terms of the functionality of online activity in much the same way. Because the two models share a transformation focus, research findings of this study are expected to shed light on the value of both the *Marketspace* and *eMica* approaches to E-commerce adoption.

#### 2.3.4 The Research Agenda: Cyber transformation theory

Given the history of Cyber transformation theory since its inception in 2001, it is plain that:

- empirical work intended to establish the efficacy of the model in terms of E-commerce value outcomes has not been performed; and
- any revisitation of this area needs to account for technology, and other, changes since 2001 contained within the literature that shed new light on the issue of E-commerce adoption.

Cyber transformation and the *Marketspace* model cannot be a theory fixed in time, but must be viewed in terms of business model and technology trends.

This section discusses recent publication and its implications for a research agenda on Cyber transformation theory and the *Marketspace* model. The discussion is organized around dimensions of the *Marketspace* model and, for the main part, focuses on issues of domain validity and operationalizing of the model. Both aspects are essential prerequisites for further empirical investigation.

Recall that Dutta and Segev (2001) did not validate their model by establishing the nature (if any) of the relationship between superior transformation outcomes and E-commerce value creation outcomes. Rather, in common with the empirical work done by Burgess, Cooper and Alcock (2001), they used an



operationalized version of the model (a so-called Cyber transformation scale) to measure the *extent* of Cyber transformation found in a sample of firms.

A goal of this research is to extend this work by exploring the relationship between Cyber transformation and E-commerce value creation outcomes. Although it was conceived independently, other work of this kind has also been recently performed (Golden, Hughes and Gallagher, 2003; Barua *et al.* 2001b; Zhu and Kraemer, 2002).

#### 2.3.4.1 Foundations of Interactivity and Connectivity transformation: The impact of multimedia, simulation and interaction on consumer behaviour

Although, the Dutta and Segev (2001) model was preferred for its inclusion of a technological capability dimension, the operationalizing of this dimension for the purposes of the Fortune 500 study, discussed in *Chapter One*, is a source of some concern. For example, treatment of *immersive multimedia* in the model and associated scale is ambivalent, with Dutta and Segev (2001, p.11) arguing on the one hand, that ‘simplicity is virtue’ in design:

Many leading firms have relatively simple sites that focus on providing easily accessible functionality at the expense of dazzling technical wizardry. They have realized that most web users are not willing to wait for more than a few seconds for a page to load, something that is often not possible for pages rich in graphics and video.

But elsewhere that effective use of immersive interactive technologies (e.g., *Macromedia Flash*) is a hallmark of well constructed sites (*ibid*, p.11):

Shell, U.K., for example, uses Shockwave to provide the user with an animated outline of the whole process of exploring crude oil and getting it to the consumer as gas. Most media firms use a variety of video and audio tools to provide customers with a rich multimedia experience.

Has recent research shed light on the value of this aspect of technology transformation?

Gretzel and Fesenmaier (2003, p.49) argue that consumption and decision making processes in tourism are “to a large extent driven by hedonic and

emotional aspects” and that the ‘experiential’ nature of tourism “calls for innovative ways for communicating tourism experiences”.

In a study of the impact of the Internet on the tourism industry, Rayman-Bacchus and Molina (2001, p.9) see huge potential for interaction, animation and simulation to impact on consumer behaviour, through appeal to our emotions:

The competitive landscape of Internet-based service provision, of which tourism is a large part, is becoming more differentiated, fuelling the continued convergence of communication technologies, and forcing down the cost of bandwidth. The traditional utilitarian assumptions of the rational consumer making cost/benefit assessments will give way to innovations appealing to our emotions more forcefully than hitherto possible. We can expect our senses and imagination to be exercised from the comfort of our desktop: to be able to see, hear, touch, and smell far away places, without ever going there.

De Waal (2004, p.35) sees interactive features such as forums, forms, databases and multimedia as essential elements of *stickiness*, the features carried by a site that extend the duration of visits and make for repeat customers. Buhalis (2003, p.92) sees virtual reality providing the basis of simulated experience that enables users to experience a destination or tourism product through “all their senses.” In combination with animation, video, pictures, sound and personalization, Buhalis (2003, p.93) simulation will drive a revolution in marketing that will empower marketers to exploit niche markets.

Outside the context of tourism, the wider research literature on interaction, animation and simulation, is more rigorous, grounding assertions of impacts on user behaviour in quantitative observation. For example, in a quantitative study of the impact of Web interface characteristics on consumers’ online shopping behaviour, Weiyin Hong (2002, p.xii) raises concerns about the value of *animation* in terms of information processing:

Animation has been widely used on the commercial websites to attract consumers’ attention. Results of study two suggest that although salient features do attract attention, they may not lead to increased information processing as generally expected in the industry.

In another quantitative study, Coyle and Thorsen (2001, p.75) establish a case for *vividness*, but not *interactivity*:

In this experiment, we manipulated levels of interactivity (the number of choices and whether there was a clickable image) and vividness (whether there was audio and whether there was animation) in Internet marketing sites. It was expected that high levels of interactivity and vividness would increase participants' experience of telepresence, or actually being there, lead to stronger attitudes toward the web site, and lead to an increase in the consistency between attitudes and behaviours. In addition, we expected that participants who saw sites high in vividness would develop attitudes that endured over time.

We found that perceptions of telepresence grew stronger as levels of interactivity and levels of vividness in web sites increased. We also found that participants who saw sites high in vividness developed stronger attitudes toward those sites than did those who saw sites of moderate or low vividness. We found no such effect for interactivity on attitudes, and in general, we did not find the expected relationship between levels of vividness and interactivity and attitude-behaviour consistency. Finally, we found support for the hypothesis that high levels of vividness help create more enduring attitudes.

Sautter *et al.* (2003) situate the Coyle and Thorsen findings on vividness within the broader research of the effect of 'ambient conditions' on shopping behaviour suggesting that while vividness has a positive effect on shopping behaviour, excessive stimulation through vividness may be counter productive. Liu (2003) also citing Coyle and Thorsen's work, argues that user preferences for interactivity can be mismatched to the interactivity companies provide, resulting in user abandonment or non-conversions. However, Chung and Zhao (2004) claim a positive impact of perceived interactivity on both attitude and memory, a finding which these authors argue contradicts previous findings in hypertext communication (e.g. Mohagag, 1992) that many hyperlinks inhibit consumer's memory because of information overload. In a review of the literature, Liu (2003, p.1) argues that ambiguous findings on the value of interactivity in E-commerce Web sites may be due to a lack of "uniform conceptualization and operationalization of interactivity."

Thus, quantitative studies from the wider literature on interaction, animation and simulation show no agreement on the significance of interaction,

simulation or animation in web site design, a possible explanation for the contradictory positions found in the work of Dutta and Segev (2001). A positive effect on consumer behaviour in tourism is postulated, but not proven by Rayman-Bacchus and Molina (2001) and Buhalis (2003) within the context of tourism.

#### 2.3.4.2 Foundations of Interactivity and Connectivity transformation: User centred computing and Usability

Usability looms large in the literature of user centered computing, where it is considered central to the design of interactive systems, including information rich systems such as web sites (Nielsen, 2000; Shneiderman, 1997; Crystal & Kalyanaramanu, 2004). In a 1998 standard, International Standards Organization (ISO) defined Usability as:

*The effectiveness, efficiency and satisfaction with which specified users achieve specified goals in particular environments.*

*effectiveness: the accuracy and completeness with which specified users can achieve specified goals in particular environments*

*efficiency: the resources expended in relation to the accuracy and completeness of goals achieved*

*satisfaction: the comfort and acceptability of the work system to its users and other people affected by its use.*

(ISO 9241, p.11)

Nielsen (2000, p.10) identified additional dimensions to the Usability construct and offered an alternative definition:

*part of a system's acceptability and usefulness, which can be divided into learnability, effectiveness of use, memorability, faultlessness of user's actions, and user perceived pleasantness.*

In earlier work, Nielsen (1998, p.1) claimed that 90% of commercial web sites were difficult to use because of problems of latency caused by bloated page design, issues in content selection and design, obscure site structures, lack of navigation support and text optimization for print, rather than online. In 2000, Nielsen sought to establish the significance of Usability for E-commerce through Usability testing of twenty E-commerce web sites. The

results of this investigation were published in a report entitled *E-commerce User Experience*. Nielsen found that the site in the study (Amazon.com) which scored best against his *heuristic principles of Usability*<sup>10</sup> (based on a 207 item scale) was also the most profitable (King, 2002). Nielsen reported that an average of 100 to 400 per cent sales increase had been achieved when E-commerce sites launched an improved user interface (King, 2002). He concluded (Nielsen, 2001, p.1):

Usability is a prerequisite for E-commerce success. If people cannot shop, then the site won't sell a thing. It doesn't matter how cheap the products are if people can't find them or if they get stuck on a step in the checkout process.

The implications of Web Usability for E-commerce performance is also a theme taken up by Palmer, 2002; Agarwal & Vishwanath, 2002 and Hahn and Kauffman, 2004. In other work, Crystal and Kalyanaramanu (2004) found that Usability not only influenced task performance by users, but significantly shaped attitude towards the web site, a key factor in buying intentions.

Thus, review of the literature on Usability and E-commerce firm performance, suggests that a possible limitation of Dutta and Segev's (2001) model can be found in its failure to account for Usability as a CSF in E-commerce web site design and implementation. The significance of this omission for the domain validity of the *Marketspace* model may be considerable. A site demonstrating high level transformation across the *Technological Capability (Interactivity and Connectivity)* and *Strategic Business* dimensions might fail to generate high level E-commerce value creation outcomes because of Usability issues. Further research of the *Marketspace* model geared towards testing the relationship between E-commerce value creation outcomes and business transformation needs to be inclusive of the Usability of surveyed sites to deal with the domain validity issue.

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<sup>10</sup> These principles are discussed in detail in *Chapter Three*, Section 3.2, p.95.

The literature on web Usability is revisited in Chapter Three, section 3.2 in discussion of operationalization of the Usability construct, work that establishes the logic and validity of the scale adopted for Usability measurement.

#### 2.3.4.3 *Foundations of Interactivity and Connectivity transformation: Discovery*

Resource discovery (Zaiane, 1998, p.4) is:

The process of clarifying an information retrieval request and identifying and retrieving resources relevant to the request.

Whereas the marketing of web sites encompasses both online and offline activity aimed at securing market share in terms of site audience, *resource discovery* focuses on technology tactics in the Interactivity and Connectivity dimension that can improve information retrieval. The discovery of web resources is problematic because of the size of the Web, an information retrieval architecture that emphasizes recall, rather than precision, and the proliferation of enquiry engines and other information retrieval services that offer only a partial solution to user requirements. Zaiane (1998, p.35) succinctly describes the problem of discovery on the Web:

It has been demonstrated that any search engine provides the user with only 15-42% of the relevant documents. Because of the over abundance of sources on the Internet, any search query yields hundreds, if not thousands, of matches. Search engines, like traditional information retrieval systems, rank the resources found by relevancy, and present them ordered, the most relevant first. Apart from the size of the index, the model chosen and the user interface, the most important difference between search engines is the ranking mechanism. Relevance is a very subjective term. Moreover it is very difficult to ascertain the real need of the user from a query. Queries present little context and search engines do not learn from past experience.

The proliferation of web sites and web pages suggests issues in resource discovery that must be addressed in the planning, design and implementation of E-commerce web sites, if such sites are to connect efficiently with consumers. As Small (2000, p.331) remarks, businesses contemplating

E-commerce on the Web require a strategy to connect to the Internet and must create “a suitable hub of communication links from the node into the communication environment of the Internet.”

#### *2.3.4.4 Foundations of Interactivity and Connectivity transformation: Search Engine Optimization*

According to Bowen (2004, p.3) 83% of all Web research starts on search engines, making the issue of Search Engine Optimization (SEO) for resource discovery critical. For Destination Marketing Organizations (DMOs) (e.g. Tourism businesses), Bowen (2004) rates search engine visibility on the World Wide Web as critical. However, in a survey of Irish tourism DMOs, the author found that spending on web site construction far outweighed spending on SEO and that an attitude shift was required involving the “funding visibility rather than just construction” (*ibid*, p.36). In a study that addressed the relative efficiency of electronic travel markets as opposed to conventional markets, Oorni and Klein (2003) found no statistically significant difference in consumer search costs between electronic and conventional markets, rebutting the belief that the Internet had delivered near perfect information into the hands of consumers about sellers, products and product attributes. Barriers to the conduct of efficient consumer searching included the fact that “Identifying prospective sellers with suitable offerings on the Internet seems less efficient than previously expected (Oooni and Klein, 2003, p.36).

Appropriate E-strategy for connecting to the Internet and maximizing discovery opportunities should encompass (Dittenbach, *et al.* 2004; Bowen, M. 2004):

- a strategy for Search Engine Optimization (SEO) (Bowen, 2004) that aims to secure higher order ranking in match lists returned by popular search engines for common keyword searches;
- a strategy for collaboration with other firms based on the ideas of reciprocal linking and inheritance; and

- an integrated marketing strategy encompassing online advertising and promotion that connects off line activity with online activity.

Dutta and Segev's (2001) Cyber transformation scale does not deal with the information retrieval externalities of the Internet and does not comprehensively operationalize resource discovery within the *Interactivity and Connectivity dimension*. This suggests issues in domain validity for the 2001 scale that are significant and should be addressed (see section 2.5.3).

#### 2.3.4.5 Foundations of Interactivity and Connectivity transformation: Mobile Commerce and Location Based Services

Domain validity issues also arise from the emergence of Mobile or M-commerce and Location Based Services (LBS) since 2001. Nicholas Evans (2003, p.223), explains the business opportunity afforded by Mobile commerce, or so called *M-commerce*, in the following way:

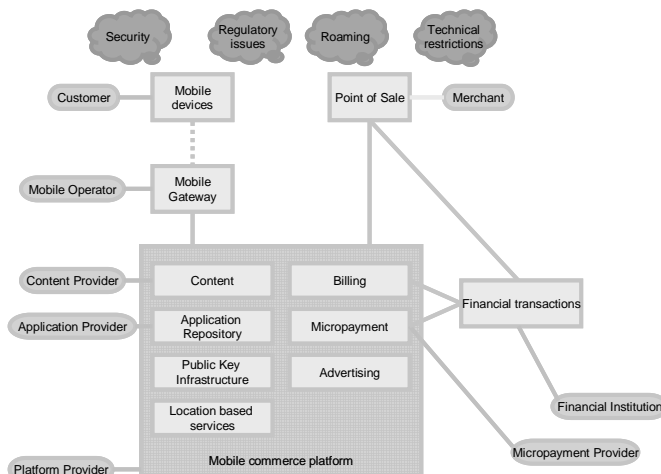
Mobile commerce, provides the opportunity for ubiquitous electronic commerce transactions unconfined by physical location or access device. Location-based services can provide the location overlay and thus the added intelligence to information and transactions. This is especially important within the enterprise supply chain, or within consumer applications, helping to locate and track people and assets.

The emergence of M-commerce based systems is seen as a critical development in eTourism (Buhalis, 2003; Benjamin, 2003; Oertels, 2002; Kanerva, 2004; Strangeways, 2003). The most successful service scenarios and business models for *M-commerce* to date have developed around subscription-based information and messaging services (Felt, 2002). However, the development of viable business models for value-added services has progressed slowly, because of network (e.g. bandwidth), middleware, security, localization and agent technology limitations (*ibid*, p.8). According to Benjamin (2003) and Felt (2002), key enablers fostering the development of value added M-commerce services include:



- the arrival of high bandwidth 3G mobile telephony supporting General Packet Radio Service (GPRS) connectivity;
- the emergence of low cost IEEE 802.11 WiFi networks; and
- new generation user agents with improved navigation and display.

Business scenarios for M-commerce (Felt, 2002) include financial services, entertainment, shopping, information services, payment and advertising. Felt (2002) also elaborates the basic architecture of the M-commerce platform (See Figure 2.4):



**Figure 2.4 Architecture for m-Commerce Platform (Felt, 2002) (Reprinted with permission of the author)**

Benchmark business applications for M-Commerce in tourism are discussed in section 3.3.6. The availability of wireless channels to the underlying E-commerce infrastructure transforms the technology capability dimension of the *Marketspace* model. The original Dutta and Segev (2001) scale did not operationalize the *Interactivity and Connectivity* dimension in terms of the new wireless channel afforded by enhanced CDMA and IEEE 802.11. The emergence of M-commerce business solutions, some involving radical new business models particular to wireless applications, describes new Cyber transformation possibilities that need to be accounted for in future research.

#### 2.3.4.6 Foundations of Transformation: Business Transformation

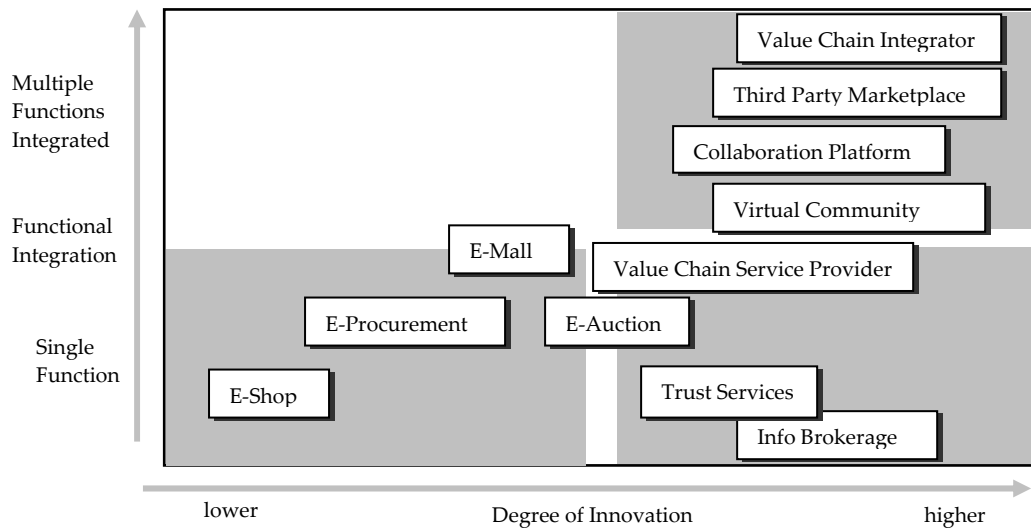
From the above discussion of research on the role of multimedia and simulation, Usability, resource discovery and M-commerce, it is plain that technological developments and new perspectives in end user computing suggest validity issues for the scale conceived by Dutta and Segev in 2001. Does publication since 2001, suggest similar validity problems in the *Strategic Business* dimension to those identified with the *Interactivity and Connectivity* dimension?

The scale adopted as the basis of the Fortune 500 descriptive study, discussed in Chapter One, contains many more items in the *Strategic Business* dimension and *Customer Relations* clusters, a finding suggestive of an emphasis in the *Marketspace* model on transformation of business models across the Four Ps of *Product, Price, Promotion and Place*. The message is clear from Dutta and Segev's emphasis on the Four Ps, this is where E-strategy and model transformation must be focused, if businesses are to succeed at E-commerce adoption.

Dutta and Segev's (2001) concept of a business model derives from Timmers (1998). According to Timmers (1998, p.4) a business model is:

- an architecture for the product, service and information flows, including a description of the various business actors and their roles;
- a description of the potential benefits for the various business actors and their roles; and
- a description of the sources of revenues.

Timmers (1998, p.5) proposes eleven basic business models for the E-marketplace (see Figure 2.5). The eleven models can be qualitatively mapped against the dimensions of *functionality* and *innovation* (See Figure 2.5):



**Figure 2.5 Classification of Internet Business Models (Timmers, 1998, p.7)**

**(Reprinted with the permission of Electronic Markets)**

Dutta and Segev (2001) ground Cyber transformation theory and the Marketspace model in observations made about E-shops, the most common business model in operation in 2001. The theory and model are therefore susceptible to ground shifts in business models that might suggest problems of relevance for the theory. As a theory also grounded in the importance of strategy, it is likewise vulnerable to research since that has either questioned the role of strategy or suggested new directions in strategy formation. Two themes in the literature review so far suggest the requirement for re-evaluation:

- the emergence of innovative models based on *C-commerce*; and
- the emergence of *E-intelligence* as an adoption enabler.

#### 2.3.4.7 C-commerce and business transformation

Movement in the Timmers taxonomy along the horizontal axis from lower to higher innovation corresponds with changes in the business model that concern operation of the value chain, new kind of business and inter-firm relationships. For example, whereas E-shops involve no or minimal inter firm relationships, E-malls (Timmers, 1998, p.5) are predicated on the idea of co-operative competition, in which firms compete with each other through a common portal interface that links individual E-shops under a collective umbrella. According to Timmers (*ibid*):

Benefits for the customer (real or hoped for) are the benefits for each individual E-shop (see above) with additional convenience of easy access to other e-shops and ease of use through a common user interface. When a brand name is used to host the e-mall, this should lead to more trust, and therefore increased readiness to buy.

Benefits for the e-mall members (the e-shops) are lower cost and complexity to be on the Web, with sophisticated hosting facilities such as electronic payments, and additional traffic generated from other e-shops on the mall, or from the attraction of the hosting brand. Revenues are from membership fee (which can include a contribution to software/hardware and set-up cost as well as a service fee), advertising, and possibly a fee on transactions (if the mall provider processes payments).

Timmers (*ibid*, p.6) laments the failure of *World Avenue*, an ambitious early attempt at E-mall construction by vendor IBM. However, while the E-mall model may have struggled, collaboration is increasingly viewed as a CSF in E-commerce adoption for SMEs. Section 2.1.7 introduced the literature on C-commerce. Collaboration in the broadest sense can range from “informal partnerships, through to strategic alliances, to joint ventures and mergers” (McGrath and More, 2002, p.13). Inter-organizational strategic alliances are common in E-commerce adoption and encouraged by catalytic programs such

as National Office of the Information Economy's *Information Technology Online (ITOL) Program*<sup>11</sup>. In this sense, the notion of an alliance:

excludes mergers and acquisitions but can incorporate joint ventures or the much more informal agreements among organizations without equity sharing (Judge & Ryman, 2001). Strategic alliances may be defined as voluntary cooperative agreements between organizations, grounded in achieving competitive advantage for the organization partners, creating value, and sharing rewards (Bennett, 2001; Das & Teng, 2000). Through appropriate synergies, they make possible what one organization alone cannot achieve, provide access to necessary external resources, foster increased learning and requisite change (Hoffmann & Schlosser, 2001).

(McGrath and More, 2002, p.13)

Section 2.2.2 contextualized the discussion of C-commerce in terms of SMTEs, the population targeted by this research. Dutta and Segev's (2001) scale does not attempt to comprehensively operationalize C-commerce. However, ranging from co-operative agreements for advertising, to paybacks for referrer sites, C-commerce is firmly entrenched in the business models of many firms that are pursuing innovative online business solutions. This is a critical change since 2001, which should be reflected in thinking about domain validity in the business transformation domain.

#### 2.3.4.8 E-Intelligence

*E-intelligence* is the capability of a firm to gather and deploy *E-metrics* generated from data mining of server logs and other resources in E-strategy decision making. E-intelligence can be regarded as a subset of a firm's business intelligence capabilities (Kalakota and Robinson, 2001) that support E-commerce strategy formation and decision making. According to Straub and Klein (2001), the development of such a capability depends upon

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<sup>11</sup> *Vide* National Office of the Information Economy. (2003). *Information Technology Online (ITOL) Home Page*. Retrieved 12 September, 2003 from:

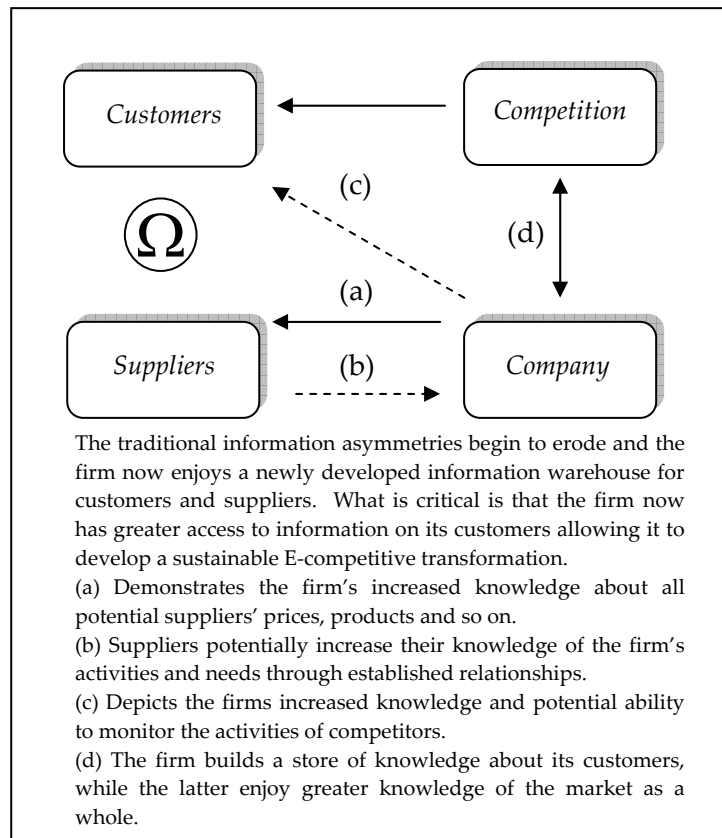
<http://www.noie.gov.au/projects/ebusiness/developing/ITOL/index.htm>

appreciation of how E-commerce on the Internet is assisting in the breaking down of traditional *information asymmetry*.

Information asymmetry (*ibid*, p.5) stems “from imperfect information of one of the parties involved in an exchange.” The significance of this process is three fold:

- firms can achieve cost reductions in the supply chain through international and other comparisons of prices made possible by the Web (*ibid*, p.7);
- firms are exposed to increased risk from more knowledgeable consumers who can exploit the Web to gain near perfect information about products (*ibid*, p.9); and
- conversely, firms can obtain near perfect information about customers opening up the possibility of customization of the value proposition, expansion of market share through better targeted marketing and transformed customer relations. These benefits accrue from the dis-intermediated nature of the Web distribution channel (*ibid*, p.10).

Straub and Klein (2001, p.8) contend that doing business online will increasingly involve strategy that exploits information asymmetries and management of information asymmetry (see Figure 2.6):



**Figure 2.6- E-competitive transformation and information asymmetry (Straub & Klein, 2001, p.9) (Reprinted with permission from Elsevier)**

Straub and Klein's near perfect information about customers and competitors that informs E-strategy in the tertiary phase of E-competitive transformation derives from the collection and analysis of E-metrics. The E-metrics available to firms include performance metrics (e.g., site hits, traffic, Usability) and marketing metrics (e.g., unique visitors, return visitors, visitor identities, recency, referrer sites and clickthrough rates). Citing Richard Hunter of Gartner Group's E-Metrix, Alexander (2000, p.2) argues for E-metrics that also work as traditional business metrics:

You can't measure success in Cyberspace by the number of eyeballs you attract any more than you can measure success by the number of people looking in store windows on Fifth Avenue. I would rather look to ratios that tell me what percentage of visitors are converted to buyers.

Alexander (*ibid*, p.2) argues for ten common E-metrics based on *reach, acquisition, conversion, retention, loyalty, duration, abandonment, attrition, churn and recency*.

Discussion so far has focussed on the kinds of E-metrics generated by Internet Service Providers and reported in various ways to Web site owners based on site activity. But review of the literature also shows that E-intelligence gathering should additionally encompass activities such as benchmarking against the online activity of competitors (Carter, 2004; Feil *et al.* 2004) and Search Engine Optimization (Bowen, 2004), both important sources of sustainable competitive advantage.

In common with Usability, Dutta and Segev's (2001) model is silent on the respective roles of E-intelligence and E-metrics in business transformation.

#### 2.3.4.9 Summary

Dutta and Segev's (2001) theory of Cyber transformation and the *Marketspace* model is challenged by recent publication on CSFs in E-commerce adoption. This challenge defines a problem for the *Marketspace* model in terms of domain validity, namely, that the domain of the Cyber transformation construct extends beyond the *Marketspace*. Extending this analysis to the scale used by Dutta and Segev (2001) to measure Cyber transformation, the existing scale exhibits a number of problems including:

- incomplete treatment and omissions in the areas of *discovery* and *Usability* (sections 2.3.4.3 and 2.3.4.2);
- the exclusion of new *channels* for E-commerce, based on wireless technologies (section 2.3.4.5); and
- omission of items in the strategy dimension reflective of the importance of *C-commerce* (section 2.3.4.7) and *E-intelligence*



(section 2.3.4.8), both of which have a logical place in business strategy formation.

The validity issues raised suggest that further empirical research based on the *Marketspace* model should proceed on the basis of a revised scale and research design that addresses them.

## 2.4 *The Research Agenda: E-commerce value creation*

The literature on E-commerce value creation and the firm is part of a wider discourse on the business value of information technology. The Review begins with a discussion of Information Systems (IS) research that addresses business value and moves on to a contextualization of this discussion in terms of E-commerce value creation. The discussion concludes with an evaluation of the 'new' and 'old' economy approaches to measuring E-value creation.

### 2.4.1. *Origins: The business value of information technology*

Observation of the so-called 'productivity paradox' (Strassmann, 1990; Berndt and Morrison, 1995) in which no relationship or even negative relationship was seen between IT investment and productivity in firms prompted what has since become an enduring theme in IS literature - the business value of information technology. Barua and Mukhopadhyay (2000) describe this literature as divisible into categories reflective of firstly, a *production economics* based approach and, secondly, a *process-oriented* approach. The production economics approach (Barua and Mukhopadhyay, 2000; Zhu and Kraemer, 2002) employs production functions to study the relationship between output measures and production input measures of factors such as IT and non-IT capital and labor. Hitt and Brynjolfssen (cited Zhu and Kraemer, 2002, p.278) describe a major limitation of this approach:

while the theory of production predicts that lower prices for IT will create benefits in the form of lower production costs for a given level of output, it is silent on the question of whether firms will gain performance advantages in terms of supra-normal firm profitability.

In a process oriented approach to measuring value from information technology, the role of IT investment is to improve intermediate operational performance, a process which may in turn affect higher levels of financial performance (Barua *et al.* 1995). In the 1980s and early 1990s, Electronic Document Interchange (EDI) provided an important focus for process oriented research. Zhu and Kraemer (2002, p.277) report that while this research was supportive of the proposition of enhanced profitability through cost savings in materials and handling and inventory reduction (Mukhopadhyay *et al.* 1995) major limitations arise from the extent to which Internet based E-commerce is different from EDI. In the quest for a new framework better suited to Internet E-commerce, Zhu and Kraemer (2002, p.277) proposed a Resource Based View (RBV) of the Net enabled organization. This and other theories that have emerged specifically as explanations of E-commerce value and its relationship with E-commerce infrastructure are discussed in the following section.

#### 2.4.2 E-commerce value creation and the World Wide Web

The invention of the Web browser in the early 1990s made possible the development of a business channel based on the Internet. Amid the excitement of early experimentation and the lure of *dot.com*, the measurement of E-commerce value took a back seat. Elements of the production economics, the process oriented approach and the RBV approach are represented in research publication devoted specifically to E-commerce business value creation and firm IT capabilities.

As discussed, Zhu and Kraemer (2002, p.277) proposed a Resource Based View which links firm performance to organizational resources and capabilities:

Firms create performance advantages by assembling resources that work together to create organizational capabilities. To create sustainable advantages, these resources, or resource combinations, would have to be economically valuable, relatively scarce, difficult to imitate, or imperfectly mobile across firms.

Lucas (2002) and Amitt and Zott (2001) are also proponents of RBV, however, Amitt and Zott (2001) argue that no single theory explains the value creation potential of E-business and that Schumpeterian innovation, network theory, transaction cost economics as well as RBV, all play a role. Transaction-cost economics as a source of E-commerce business value is a theme taken up by Malone and Laubacher (1998); Lee and Clark (1996) and Steinfield *et al.* (1999). Torzedah and Dhillon (2002) move the discussion from its traditional roots in business value to a focus on *customer* value. These researchers have adopted Keeney's (1998) idea of the value proposition as a determinant of consumer behaviour. They argue (Straub *et al.*, 2002, p.122) that:

the values consumers place on Web shopping are metrics that can be used to assess those aspects of Web shopping that matter most to satisfying customers.

Torkzedah and Dhillon (2002, p.199) believe that businesses should concentrate on the value proposition that they are putting to their customers and that "the ultimate questions about the success of Internet commerce depend upon how customers perceive its value". Leder *et al* (2001) also put the proposition of customer value arguing that organizations use the Web to improve customer relations and, hence, to derive competitive advantage. In argument similar to Amitt and Zott (2001), these authors also claim process efficiency and production economics type benefits through back end office function integration.

The high level views of business value typified by RBV, production economics and the process oriented frame, contrasts with the E-metrics approach to measuring value that emerged during *dot.com*. Proponents of E-metrics argued that the revolutionary character of E-commerce required an entirely new value system based on *new economy* metrics (NetGenesis, 2000). Beginning with crude raw site traffic data such as the number of hits, the E-metrics approach evolved to encompass E-commerce data such as users, visits, page views and customer data measuring conversions (sales), retention and

loyalty (*ibid*, p.17). As *dot.com* failures multiplied, the E-metric approach increased in breadth and sophistication to encompass more aspects of traditional firm performance measurement of the kind identified with Norton and Kaplan's (1992) Balanced Score Card framework.

#### 2.4.3 The 'Old Economy' approach to E-commerce value measurement

Surrounded by the debris of *dot.com*, 2001, the influential Harvard business academic Porter (2001), denounced the idea of the Internet as a revolutionary phenomenon in business and declared that the value of Internet enabled initiatives should be measured in terms of gains in financial performance. Contemporaneously, Anitesh Barua, Prabhudev Konana and Andrew Whinston of the University of Texas Center for Research into Electronic Commerce claimed that managers "should assess the performance of companies by looking at traditional and E-business measures" (Barua *et al.*, 2001, p.37). In *Measures for E-business Value Assessment*, they reported the results of a multi-industry survey of some 4500 US firms. The study (*ibid*, p.35) employed four 'old economy' measures of financial success:

- revenue per employee;
- gross margins;
- return on assets; and
- return on investment.

These four traditional measures were augmented by eight *E-measures* (*ibid*, p.36):

- percentage of revenue generated online;
- percentage of online MRO (maintenance, repair and operational supply procurement);

- percentage of online production goods procurement;
- order delivery cycle time;
- number of incorrect order fulfillment incidents per month;
- percentage of service requests resolved online;
- percentage of new customers acquired online; and
- percentage of existing customers doing business online.

The Barua *et al.* (2001b) study found that eight E-business drivers were highly correlated with firms that measured up well in terms of the performance measures. These drivers were (*ibid*, p.35):

- systems integration;
- customer orientation of IT;
- supplier orientation of IT;
- internal orientation of IT applications;
- customer related processes;
- supplier related processes;
- customer E-business readiness; and
- supplier E-business readiness.

An important finding from the Barua *et al.* (2001b) study was that firms observed to be performing successfully against the eight E-measures used were also observed to be performing against the four old economy measures (*ibid*, p.37).

Since 2001, the resurgence of traditional measures of firm performance in evaluating E-commerce initiatives suggested by Porter, 2001 and Barua *et al.*, 2001, has gathered ground in E-commerce research (Zhuang and Lederer 2003; Zhu and Kraemer, 2002). This re-assertion of traditional business theory and practice has influenced the trajectory in E-metrics which has expanded beyond raw data measures to include financial performance and customer relations measures. For example, Hunter (cited Alexander 2000, p.2), favors E-metrics that are strongly correlated with traditional performance measures. Hunter (*ibid*, 2000, p.3) argues for the rejuvenation of Web metrics based on measures that focus on dimensions of customer experience and satisfaction, including retention, loyalty, duration, abandonment, attrition, churn and recency.

However 'hard', 'fast' and 'valid' such measures may be in terms of traditional business performance measurement, it would be a mistake to conclude that there are no dissenting voices on the matter of E-commerce value creation measurement. Straub *et al.* (2002, p.119) argue that "these measures suffer as dependent variables in as much as they are affected by many factors outside network enabled systems including industry conditions, competition and the health of the economy at any particular time." They conclude that "new indices of contribution, productivity, relationship profits and value creation are needed" (*ibid*, p119). Work on the business value of E-commerce is ongoing and E-value creation measurement remains a fertile and active area of investigation.

#### 2.4.4 Summary

The *dot.com* events of December 2000 initiated a counter revolution in measuring the value of E-commerce. The hall mark of this counter revolution is the adoption of performance measures for value creation that are either wholly traditional or comprise E-measures observed to be strongly correlated with success when measured against traditional measures (Alexander, 2000;

Zhu, 2004; Zhuang and Lederer, 2003; Zhu and Kraemer, 2002; Zhu, 2004). Barua *et al.* (2001b) claim to have validated eight E-measures of value creation by observing strong correlation between these measures and financial performance measured against the four classic metrics of revenue earned, gross margins, return on assets and return on investment. According to Straub *et al.* (2002) many old economy metrics suffer as dependent variables that are influenced by factors outside the information systems context. Although some promising new directions in E-commerce value creation measurement have emerged since 2001, such research is in its infancy and lacks validation.

## *2.5 Conclusion*

The literature review has canvassed a number of competing theories and explanations for E-commerce adoption. A common thread in this work is the importance of a strategy for doing business online (so-called E-strategy). Some of this work is prescriptive (Small, 2000; Dutta and Segev, 2001; Evans and Wurster, 1999; Straub and Klein, 2001) and some is based on quantitative research purporting to show a relationship between E-strategy and E-commerce value creation outcomes (Golden, Hughes and Gallagher, 2003; Korchak and Rodman, 2001). The literature encourages further exploration of the role and significance of E-strategy.

A number of theoretical frameworks exist that aim to explain (Straub and Klein, 2001; Dutta and Segev, 2001; Small, 2000) the nature and role of E-strategy in E-commerce adoption. While there appears to be agreement in the literature about the importance of E-strategy in E-commerce adoption, and empirical evidence exists showing a relationship between E-strategy and E-commerce value creation outcomes (Golden, Hughes and Gallagher, 2003; Korchak and Rodman, 2001), none of the E-strategy based models has been validated. This observation sets the scene for the substantive task of the current work, a quantitative investigation of the role of E-strategy in E-

business adoption that has, as its starting point, Dutta and Segev's (2001) theory of Cyber transformation and the *Marketspace* model.

#### 2.5.1 Character and limitations of existing research on Cyber transformation

In the conduct of the work, care needs to be taken that limitations of existing research are identified and addressed. The literature review suggests two basic issues with Cyber transformation theory and the *Marketspace* model that should shape further research on the efficacy of business transformation theory as a prescription for E-strategy. Respectively, these issues concern:

- the failure of existing research to demonstrate a relationship between Cyber transformation outcomes and E-commerce value creation outcomes; and
- operationalization of the *Cyber transformation* and *business strategy* constructs.

#### 2.5.2 The Relationship between Cyber transformation and E-commerce value creation outcomes

The usefulness of a theory about business transformation and the Internet must be grounded in exploration of relationships observed between kinds of Cyber transformation and E-commerce value outcomes. It has been argued here that the main problem with Dutta and Segev's (2001) original work on Cyber transformation theory and the *Marketspace* model is a failure to establish its significance and usefulness by testing for this relationship. On investigation, the empirical work undertaken by the authors<sup>12</sup> has been shown to be descriptive of the kinds and extent of Cyber transformation achieved in a

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<sup>12</sup> Dutta, S. and Segev, A. (2001). Business transformation on the Internet. *E-Commerce and V-Business*. Barnes, S. and Hunt, B. (Eds.), Oxford. Butterworth Heinemann. 5-22.



sample of firms. The research casts no light on the problem of whether a relationship exists between transformation and E-commerce value outcomes. Zhu and Kraemer (2002, p.276) argue that this is not unusual in the research literature on E-commerce adoption, which is characterized by an “absence of empirical data to gauge the scale and characteristics of Internet initiatives and their impact on firm performance”. In the wake of *dot.com*, the work of Barua *et al.* (2001) and Golden *et al.* (2003) and Zhu and Kraemer (2002) show a better direction for E-commerce adoption research. An important finding from the Barua *et al.* (2001b) study concerns validation of eight E-measures of value creation, a claim made on the basis of an observed correlation between these measures and the four classic financial success measures.

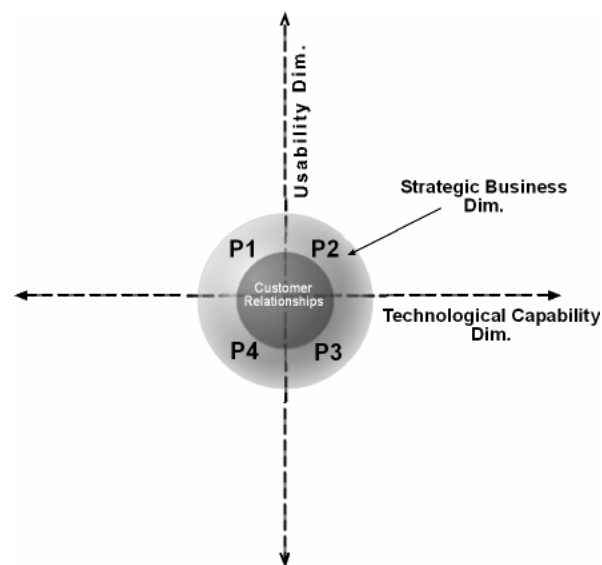
If Cyber transformation theory has anything to contribute as a prescription for good practice in doing business online, then well constructed research ought to be able to demonstrate a relationship between increasing levels of transformation and improved E-commerce value outcomes. After all, this is the kind of claim made by Barua *et al.* (2001b, p.36) in a study which purports to show that investment in a discrete number of E-business drivers correlates positively with financial success across the measures of revenue per employee, gross margin, return on assets and return on investment. Dutta and Segev's (2001) study, contains no confirmation of such a relationship for their E-strategy model. The demonstration of such a relationship would provide valuable justification for the model.

#### *2.5.3 Implications of domain validity issues for further empirical research: Usability, Resource discovery and E-intelligence*

Through the lens of publication since 2001, a number of domain validity issues have been identified with implications for both the technology capability and business strategy dimensions of the *Marketspace* Model. In regard to the former, Cyber transformation theory is bounded by the domains

of *Interactivity* and *Connectivity*, and fails to acknowledge *Usability*. The case for *Usability* as a CSF in E-commerce adoption is compelling, suggesting that research of the *Marketspace* model geared towards testing the relationship between E-commerce value creation outcomes and Cyber transformation should aim to be inclusive of the Usability of surveyed sites.

Conceptually, an enhanced *Marketspace* model inclusive of Usability might be represented diagrammatically in the following way (see Figure 2.7):



**Figure 2.7 E-Marketspace (Enhanced Marketspace Model inclusive of Usability)**

Resource discovery strategy is also unrepresented in the original model and Cyber transformation scale. Important facets of resource discovery strategy that are un-represented include:

- search engine optimization (Bowen, 2004) which determines whether consumers can readily discover sites that host products or services in which they are interested<sup>13</sup>;

<sup>13</sup> Vide Section 2.3.4.3, p.71.

- strategy for connecting with the customer via industry portals and directories (European Commission, 2002); and
- strategy for creating a suitable hub of communication links from a node (such as an E-commerce Web site) into the communication environment of the Internet (Small, 2000).

Alas, Dutta and Segev (2001, p.8) describe five features of 'technological sophistication' that describe technology capability in the design and implementation of E-business web sites, but none of these features effectively address information retrieval on the Internet, referred to here as *resource discovery*. The literature review has established that strategy for discovery is another CSF in E-commerce adoption.

The issue of discovery is indicative of a wider problem in the literature concerning the *granularity* of research on Cyber transformation. Descriptive studies, thus far, have lacked sufficient granularity in measuring the technological capabilities that are likely to be important in online innovation. For example, in their descriptive study, Golden, Hughes and Gallagher (2003, p.8.) found that firms with better information systems and information technology expertise were more successful in relation to two of three measures of online success. However, the question of how this expertise translates into technological capability that is important to online success exceeded the scope of the Golden, Hughes and Gallagher (2003) study.

In the business strategy domain, no provision is made in the *Marketspace* model or Cyber transformation scale for the transformation of *business intelligence* into *E-intelligence*, a set of strategic decision making capabilities that draw upon what Straub and Klein (2001) refer to as *E-competitive transformation* opportunities arising out of the breaking down of traditional information asymmetries by the Internet. Recall that Straub and Klein (2001) argue for a concept of E-competitive transformation grounded in exploitation

of the new information asymmetries brought about by the Web. Section 2.3.4.8 explores the nature and significance of E-intelligence for Cyber transformation of the firm.

Additionally, as the review of recent publication on C-commerce and social network theory showed (sections 2.1.7 and 2.1.10), rich understanding of E-commerce adoption outcomes requires investigation of relationships between firms and not merely a focus on transactions (Rowe, 2004). The nature and effectiveness of C-commerce community building ranging from low level, low cost co-operative arrangement governing online partnering (such as reciprocal linking), to fully fledged collaborative environments (such as shared infrastructure in the form of portals) forms the basis of such investigation. Information flows between firms describing social networks for the exchange of E-commerce ideas and sharing of expertise are also at the forefront of emerging literature.

It is clear from this discussion of domain validity and construct operationalization, that further research aimed at validation testing of the *Marketspace Model* should proceed on the basis of a revised scale instrument and research design that addresses these issues.

This review concludes with observations grounded in the literature that shape the research questions and the research methodology adopted for this study.

#### *2.5.4 Implications of domain validity issues for further empirical research: Research design*

In addition to issues of face validity in scale construction, the literature is instructive in terms of research design. A possible explanation for the domain validity problems identified in the work of Dutta and Segev (2001) resides in the seductiveness of a simple research design based on aggregate analysis of public data sets (web sites). The quest to understand why some firms succeed

at E-commerce and others do not requires multiple instruments and approaches. The research described in later chapters is expected to address a key failure of the Cyber transformation school in research conducted by this school to date, namely, its purely descriptive character. In their analysis of E-commerce value creation outcomes and CSFs, Golden *et al.* (2003) and Barua *et al.* (2001) provide an alternative approach to the conduct of E-commerce adoption research.

In summary, to move the discussion forward on CSFs and theoretical frameworks for E-commerce adoption:

- the descriptive study approach must be modified in favor of research that investigates what the empirical evidence has to say about degrees of business transformation and derived E-commerce value; and
- greater granularity is required involving research that not only investigates the contributions of *Technological Capability* and *Strategic Business* transformation, but also clusters and CSFs within these dimensions in terms of E-commerce value creation outcomes.

The proposed research therefore involves a commitment to E-commerce value creation measurement, and the testing of relationships between E-commerce value creation outcomes and Cyber transformation outcomes as a whole and within clusters. These objectives conform with recent publication and directions in E-commerce adoption research. This work attempts to absorb the lessons of the *dot.com* era and re-assert traditional business success measures in evaluating online business transformation outcomes.

### 3 Literature review: Research design

#### 3.1 Introduction

*Chapter Two* concluded with the assertion of a model (Figure 2.7), grounded in the literature, inclusive of directions in recent research that provides the basis for the investigation to be undertaken. *Chapter Three* extends this literature investigation and paves the way for the elaboration of research methods and design, by discussing the research literature that bears upon operationalization of constructs represented in the model. According to Aneshensel (2002, p.31), operationalization is the “translation of theory into explicit expectations or hypotheses that can be tested by empirical observation.” This work provides essential justification for the instruments that are used to measure Cyber transformation, a core task in the research. It also informs the user and functional requirements specification adopted for the quasi-experimental portal component of the study.

In discussion order, the model constructs investigated in this section of the literature review comprise *Usability*; *Technological capability* and *Strategic business transformation*.

Discussion of *Usability* criteria proceeds from a substantial research literature grounded in cognitive psychology and the study of human computer interaction. Discussion of *Technological Capability* and *Strategic Business Transformation* criteria are grounded in Porter’s (1985) theory of competitive advantage, and subsequent work by Lucas (2002) and Affuah and Tucci (2001) on the use of technology to provide the basis of sustainable competitive advantage. The work of De Waal (2004) on Internet marketing and Shukla and Pather (2004) on E-commerce customer satisfaction substantially shape exploration of the literature on *Strategic Business Transformation*.

Instrument design and construction procedures are discussed in *Chapter Five*, the Research Methods and Design.

### 3.2 Construct operationalization: Usability

Section 2.3.4.2 elaborated a concept of Usability and its purported association with E-value creation (Nielsen, 2000; Palmer 2002; Agarwal and Vishwanath, 2002; Hahn and Kauffman, 2004). Section 2.5.3 of the same Chapter, described a revised Cyber transformation model, inclusive of a Usability dimension, that is to provide the basis of hypothesis testing. It remains to elaborate the research literature on *Usability* that concerns construct operationalization and internal validity in the research design.

Measures for evaluating user acceptance of Web sites have been comprehensively developed by Nielsen (1994b, 2000a); Palmer (2002) and Agarwal and Venkatesh (2002). In their Web Usability study, Crystal and Kalyanaramanu (2004, p.2) citing work by Frokjaer, Hertzum and Hornbaek (2000) report issues with validation and that “correlations among the measures may vary widely depending on task domain and context”. In a study concerned with validation testing of instruments created by Palmer (2002) and Agarwal and Venkatesh (2002), Green and Pearson (2004, p.38) concluded that only the Palmer (2002) instrument based on the five factors of *download delay, navigation, content, interactivity and responsiveness* could be recommended for its utility in research examining Web site use in an E-commerce setting. However, this study employed confirmatory factor analysis to determine nomological validity and did not explore association between measures and E-commerce value.

In *E-commerce User Experience* (Nielsen, 2001), Jakob Nielsen claimed positive association between his so-called *heuristic principles of usability* and firm profitability. An overview of this study is provided in section 2.3.4.2. In order, these *heuristic principles of usability* (Nielsen, 1994b) were:

1. Visibility of system status.
2. Match between the system and the real.
3. User control and freedom.
4. Consistency and standards.
5. Error prevention.
6. Recognition, rather than recall.
7. Flexibility and efficiency of use.
8. Aesthetic and minimalist design.
9. Help users to diagnose and recover from errors.
10. Help and documentation.

Thus, the work of Nielsen (1994b, 2000, 2002) and Palmer (2002) lays claim to validation, the former through claimed positive association with E-value creation outcomes, the second through nomological validity testing using confirmatory factor analysis. Review of the wider literature on Usability shows that measures adopted from Nielsen (1994b, 2000, 2002) and Palmer (2002) are also found elsewhere in the performance evaluation literature on Usability: e.g., McKenzie (2000), Corry *et al.* (1997), Gullikson *et al.* (1999), Shneiderman, (1998) and Rosenfeld (1997). This work will now be discussed in detail.

First popularized by Simpson and McKnight's (1990) work on hypermedia navigation, the concept of a *user mental map* that is internalized in the human mind and which is the analogue to the physical layout of the environment in which a human operates (Tolman, 1948), provides a foundation for operationalization of the first of Nielsen's heuristics principles.



McKenzie, K. (2000, p.1) comments:

“The system should always keep users informed about what is going on, through appropriate feedback within reasonable time.

The user always needs to know exactly what the system is doing, and with web sites this includes letting the user know where they are. Feedback on the web can be as subtle as a depressed button, or as complex as java window help files.”

In another study, Crystal and Kalyanaramanu (2004) found that labeling and feedback were significantly associated with attitudes towards web sites. As Crystal and Kalyanaramanu (2004, p.3) also note, feedback can be textual (e.g., a description of the system’s status), visual (e.g., a progress bar), or auditory (e.g., a tone that sounds when a process is complete). For example, if a Flash executable or video is in the process of downloading causing latency, textual or visual feedback informing the user that this is the case, avoids confusion in the user’s mind about the system’s status. The user’s whereabouts in the system should also be readily discoverable. Site maps and dimmed buttons and links provide this essential feedback.

*Download delay* and its relationship with site abandonment is a theme in Usability taken up by Palmer (2002); Nielsen (1994b) and Ramsay, Barbesi, and Preece (1998). All report the significance of latency for user acceptance of Web sites. Various benchmarks exist for latency. Most critical is the response time, i.e., the time taken for a system to respond to a request for information. Mahadevan, Braun and Chaczko (2002, p.4) acknowledge three kinds of response time that characterize human computer interaction:

1. The time required if the user is to perceive that the computer is reacting instantly to any command;
2. The maximum time for which the user’s flow of thought will be uninterrupted; and
3. The threshold time that a user’s attention remains focused on the flow of actions of the software or with a web site.

Acknowledging that some Quality-of-Service (QoS) evaluations benchmark response time for Web users at 10s, Mahadevan, Braun and Chaczko (*ibid*) acknowledge a so-called “basic 8-second rule” that is consistent with user acceptance for web page downloads. This rule has been adopted by industry giant Macromedia in Dreamweaver MX 2004, the tool used in this study for optimization testing. In practice, optimality is not achieved by users in analogue circuits due to latency, congestion and efficiency issues. Thus, a home page requiring 8 seconds to download under optimal conditions, would take longer under normal conditions, unless the page existed in a proxy server cache.

Nielsen’s second heuristic principle asserted that there should be a match between the system and the real. This theme is taken up by McKenzie (2000, p.1):

The system should speak the users’ language, with words, phrases and concepts familiar to the user, rather than system-oriented terms. Follow real-world conventions, making information appear in a natural and logical order.

McKenzie’s work on the nature and significance of *information architecture* in Web design draws upon work by Rosenfeld and Morville (1998; 2002) who used it to define a ‘blueprint’ for information organization and access for web sites involving classificatory structure, labeling of concepts within that structure, navigation and searching systems. In a review of information architecture and usability, Gullikson *et al.* (1999, p.1) anchor the idea of a blueprint in:

... a classificatory scheme that includes classes and subclasses that are hierarchically ordered so that each class shares the same or similar attributes and characteristics. Ideally, each class represents a distinctive concept with discriminating and unambiguous labels and with controlled lexical relations: synonymy, homonymy, polysemy, metonymy, hyponymy/hyperonymy, meronymy and antonymy. In essence, this is standard menu design for information retrieval systems (Giroux and Belleau, 1986; MacGregor and Lee, 1987) with roots in the traditional organisation of knowledge.

Information retrieval menus must “typically represent the key topics or categories of information” (*ibid*). But:

A body of information may be organized in many different ways: mirror an organisation's formal structure, reflect the functional use of the site, provide pathways by client need and interest, reflect a chronological sequence, reveal the frequency of use, or show a geographical orientation. Often one method is chosen as a single pathway to the information base.

(*ibid.*)

A blueprint must also specify “how the structure will be navigated” and “how the user will identify position.” (*ibid*). Gullikson *et al.* (*ibid*, p.2) conclude that:

“The choices available for an information architecture are myriad but, optimally, must suit the purposes for which the site is intended and meet the needs of its user group.”

A variety of paradigms exist for Web site navigation based on menus, clickable icons and hypertext. In navigation, benchmarks concern:

- consistency and standardization in the use of icons and *navigation* schemas;
- avoidance of icon only elements that pose recognition problems;
- *operational functionality* (there should be zero instances of dead links producing browser errors); and
- use of visual cues to enable the user to recognize their location within the site.

Instone (2004, p.75) refers to information architecture as an “invisible layer between the user interface and content” and expands earlier ideas of Rosenfeld and Morville (1998), specifically to encompass E-commerce Web sites where it specifies (*ibid*):

- the major organizational scheme of the site;
- the product organizational scheme;
- the labels used for product categories and functionality;
- the global navigation;
- the local navigation; and
- the contextual navigation.

Nielsen (1994a) determined that efficient interaction online would work on the basis of recognition, rather than recall, requiring a *consistent user interface* and *standard use of the technology*. These ideas were presented as heuristic principles four and six (McKenzie, 2000, p.1). Work by Tullis, 1988; Shneiderman and Plaisant, 2004; and Niemala and Saariluoma, 2003 provides experimental confirmation of the importance of stability and consistency in successful interface design. Non-standard use of the technology became common practice in the mid 1990s, as Web designers and programmers sought to differentiate Web sites with that treated familiar Web objects such as buttons, links, windows and tool bars differently. Disabling of the browser back button, popUps and removal of the browser tool bar are practices from this period that involve non-standard use of the technology. The presence of such features also violates heuristic three, namely, the requirement to respect user control and freedom.

Developers can remove *user control* and restrict user freedom by disabling native browser functions. For example, the programming of popUp windows in kiosk mode deprives users of control of window behaviour. The problems for Usability involved in these design tactics are identified by McKenzie (2000, p.1):

“Users often choose system functions by mistake and will need a clearly marked ‘emergency exit’ to leave the unwanted state without having to go through an extended dialogue. Support undo and redo.

Most browsers have a back button built in allowing for immediate recovery from pushing the wrong button. But many flash sites dump the user into ‘kiosk’ mode which has no such features. “

A non-standardized interface creates an ambiguous mental model in the mind of the user resulting in less effective interaction and user frustration. Rather than relying upon recognition, a user will require recall to negotiate a site successfully. A consistent interface is defined by:

- a common template across pages; and
- standardized icons and interactions resulting in a consistent look and feel across a site.

Issues in interface design and *operational functionality* are also pivotal to achieving *efficient E-commerce transactions*. Poor design and implementation is rated as a very common explanation for customer abandonment of online transactions (Treese and Stewart, 2003). Error prevention and recovery are also represented in Nielsen’s (1994b) work as heuristic principles five and nine. Nielsen was an early advocate of software engineering principles to web design and, subsequently, went on to develop a notion of ‘usability’ engineering. Abandonment of shopping cart transactions because of non-recoverable errors is an important cause of E-commerce failure. Abandonment (Alexander, 2000, p.64) is the process of a customer “leaving a shopping cart without completing a purchase.”

Acknowledged (Greenspan, 2003; Nielsen, 2001; Eisenberg, 2003) causes of abandonment include:

- mandatory input fields that result in user frustration (an issue in interface design and usability);
- failed transactions arising from invalid input (often attributable to insufficient input validation or other basic coding issues);
- insufficient attention to the user mental map in cart design (typically involving insufficient feedback on system processes or user confusion about their whereabouts in the system).<sup>14</sup>
- erosion of trust (the customer is uncomfortable with the level of authentication or support for secure transactions. For example, through explicit support of encryption protocols such as SSL).<sup>15</sup>

### 3.2.1 Summary

Review of the wider literature on Usability shows that measures adopted from Nielsen (1994b, 2000, 2002) and Palmer (2002) are also found elsewhere in the performance evaluation literature on Usability: e.g., McKenzie (2000), Corry *et al.* (1997), Gullikson *et al.* (1999), Shneiderman, (1998) and Rosenfeld (1997). Work by Green and Pearson (2004) involved validation testing of instruments created by Palmer (2002) and Agarwal and Venkatesh (2002). These authors concluded that only the Palmer (2002) instrument based on the five factors of *download delay, navigation, content, interactivity and responsiveness* could be recommended for its utility in research examining Web site use in an E-commerce setting. In *E-commerce User Experience* (Nielsen, 2001), Jakob

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<sup>14</sup> Nielsen's (2000) first heuristic principle. For an explanation of the significance of mental map in designing for usability vide p.97.

<sup>15</sup> An excellent discussion of the role of trust in efficient E-commerce transactions can be found in Jones, S. (2000). Trust requirements for E-commerce. *Communications of the Association for Computer Machinery*. 43(12), 81-87.

Nielsen claimed positive association in an E-commerce setting between his so-called *heuristic principles of usability* and firm profitability. Thus, review of the literature suggests that operationalization of Usability should proceed on the basis of the Palmer (2002) and Nielsen (1994b, 2000, 2002) measures. These are discussed further in the context of instrument construction procedures in section 5.4.1.

### 3.3 Construct operationalization: Technological Capability

Interactivity and connectivity together comprise the Technological Capability dimension of Dutta and Segev's (2001) *Marketspace* model. Section 2.3.4 details a variety of problems with the way in which technological sophistication was originally operationalized by Dutta and Segev (2001). This section of the literature review reflects on recent research and other publication that impacts on operationalization of the Technological Capability construct. The discussion is grounded in RBV thinking about the role of technology in securing competitive advantage (Affuah and Tucci, 2001; Straub and Klein, 2001; Lucas, 2002). Instrument design considerations include *point-of-presence, enabling technologies, discovery and channels*.

#### 3.3.1 Internet Point-of-Presence (PoP)

Whilst much literature is focused on E-commerce Web sites as the locus of online retailing, it is not inevitable that a firm must maintain its own Internet *Point-of-Presence (PoP)* (i.e., a web site) to generate online sales to consumers. Revenue can be earned online without such a resource. For example, a survey of Australian businesses undertaken by the Australian Bureau of Statistics (ABS) in 2002, ABS (2002b) found that of businesses earning income from the sale of goods and services via the Internet or Web during the financial year to June 2001, just under one third received orders via the Internet, but had no Web site. A business that elects not to pursue its own Internet PoP, might develop E-strategy on the basis of portals and online directories of products and services. In so-doing, costs accruing to web site development,

maintenance and hosting are avoided. For SMTEs, such costs assume greater importance than for larger businesses. But the evidence from the literature demonstrates strong SMTE preference for an Internet *Point-of-Presence (PoP)*. In a scoping study conducted around the industry selected for this research, the Co-operative Centre for Sustainable Tourism, found that of two thousand five hundred (2,500) Small to Medium Sized Tourism Enterprises (SMTE's) included in the study, some two thousand (2000) had their own Internet PoP, representing eighty per cent (80%) of the sample (CRC, 2000, p.4).

A business opting not to have its own Internet PoP must depend upon *infomediaries* (Hagel, 1996) such as industry portals for B2C information flows. *Portals* are online gateways to information that provide an integrated interface and organizational structure to Web deliverable content. According to Equat's Glossary of E-business Terms, a portal is:

A high-traffic, broadly appealing Web site with a wide range of content, services, and vendor links. It acts as a value-added middleman by selecting the content sources and assembling them together in a simple-to-navigate (and customize) interface for presentation to the end user. Portals typically include services such as e-mail, community, and chat.

(Equat, 2003, p.11)

Reliance on portals can reduce costs, but also carries disadvantages. Tassabehji (2003, p.179) refers to the hidden costs of infomEDIATION and the "need for new layers and skills to be added to the value chain." Harmon, Rosen and Guttman (2001) describe the how portals promote price competition between firms. Kalakota and Robinson (2001) describe how the increasing popularity of fee per transaction charging with portal providers, adds to the costs doing business online. In *Competitive Advantage*, Porter (1985) describes three approaches to securing competitive advantage based on *cost leadership*, *differentiation* and *focus*. While portals reduce costs, they also reduce opportunities for product differentiation.



Section 2.3.4.3 discussed another consequence of *infomediation* with negative implications for firms relying wholly on portals, namely, problems with discovery arising from poor search engine ranking (Bowen, 2004). Such discovery problems may be compounded where portals generate pages dynamically that cannot be indexed by search engines. Another limitation described by Amor (2002, p.262) concerns the proliferation of portals offering similar services. A business that does not have its own Internet PoP, will also have reduced opportunities to gather metrics for measuring the effectiveness and direction of marketing and advertising (Tassabehji, 2003). Additionally, a business that does not have its own registered domain and relies solely upon a *non-virtual directory* (usually found in a portal) will have reduced opportunities to create brand awareness (De Waal, 2004), must depend upon the policy and practices of the directory owner, and can suffer from issues of reduced visibility, reduced opportunities for differentiation and loss of control.

Thus, an Internet PoP based on a registered domain and E-commerce web site provides competitive advantages to business compared with directory and portal *only* solutions (Kalakota and Robinson, 2001). However, since Web sites are readily imitated, an Internet PoP alone cannot provide the basis of sustainable resource based competitive advantage in isolation (Affuah and Tucci, 2001). Just as businesses cannot rely exclusively on portals for E-commerce business solutions, neither can they exclusively rely on E-shops. In concert with an Internet PoP, portals provide content, links and services that can influence consumer buying behaviour and also provide opportunities to connect with customers.

### 3.3.2 Portals and inter-connection

The value of *portals* and *inter-connection*, generally, as part of E-strategy is a recurring theme in the literature (Small, 2000; Dittenbach, *et al.* 2004; Bowen, 2004, De Waal, 2004). The key to attaching to the network is an idea borrowed

from object-oriented programming, namely, 'inheritance'. Inheritance means that an object belonging to a class shares its properties. Doing online business according to the inheritance principle enables members of a class to share benefits that they might not otherwise derive. In an industry portal or directory for example, a firm derives advantages from services, content and list aggregation that are shared. In microeconomics, such an outcome is referred to as a 'positive externality'.

Inter-connection via portals and links also assists with discovery by maximizing nodal opportunities for customer connection and improved search engine ranking. For De Waal (2004), portals and directories provide the basis of online promotional strategy. In operationalizing Technological Capability, the literature suggests the importance of portals and inter-connection, factors not comprehensively dealt with in the Dutta and Segev's (2001) original work on construct operationalization, work that focused exclusively on E-commerce Web sites as the locus of online retailing.

### 3.3.3 Enabling Internet Technologies

Affuah and Tucci (2001) describe a framework for analyzing the impact of technology resources on firm competitiveness, based on the criteria of *imitability* and *complementary assets*. Imitability (Tassabehji, 2003, p.194) describes the potential for a technology to be copied, substituted or leapfrogged by competitors. Complementary assets are factors such as customer service, relationships, community, brand and trust that can also be leveraged by technology to provide the basis of competitive advantage (*ibid*).

There is a substantial research literature on the leveraging of complementary assets in business transformation for online retailing. This literature is discussed in Section 3.4. Within the Technological Capability dimension of the Marketspace Model, these factors impinge upon selection of *Enabling Internet Technologies*.

Technology choices are determined by business requirements and other requirements such as user and functional requirements for personalization, customization and community. E-commerce Web sites can be based on a variety of architectures involving the concepts of 'push', 'pull', and combinations of both. A *Server resident/Client pull* site employs static HTML/XHTML to serve content located on the Internet Content Host (ICH) 'pulled' by the client via a *http* request.

*Server resident/Client pull* is the least sophisticated, but most pervasive of Web technologies. Content originates with the owner and/or business solution provider (often the Internet Content Host). In basic form, a site employing static HTML/XHTML to serve content located on the Internet Content Host (ICH) 'pulled' by the client via a *http* request is easily imitated by competitors. Such sites also entail disadvantages for users, who cannot shape the virtual space by uploading digital objects or experience a sense of community based on the sharing of experience online via synchronous or asynchronous communication. Amor (2002, p.450) describes static HTML/XHTML as standards that hinder the development of new applications because they are "not designed to do anything but present documents in a Web browser". Thus, an E-commerce capability based on *Server resident/Client pull* and static HTML/XHTML comprises an inflexible enabling technology that is unsuited to the delivery of personalized or customized services. Unlike eXtensible Markup Language (XML), neither can it be used for data interchange and repurposing of data (Blochl and Wolfram, 2002).

Effective leveraging of complementary assets and construction of inimitable resources requires different enabling technologies. Maedche and Staab (2003) argue for a service oriented underlying systems architecture that utilizes *Peer-to-Peer* (P2P) rather than client/server technology. Coupled with the semantic web, these authors see rich possibilities in tourism stemming from a new

capability for integrating disparate services on the fly. More commonly, the quest for resource advantage depends upon the technologies of *Web database*.

Web database confers competitive advantages that arise from the ability to generate dynamic as opposed to static pages and to integrate back end processes involving cost savings (Amor, 2002). De Waal (2004, p.35) takes a different position on Web database, grouping it with forums, forms and multimedia as essential elements of *stickiness*, the features carried by site that extend the duration of visits and make for repeat customers.

The resource advantages that accrue to Web database are not easily imitated by SMEs. Australia's National Office of the Information Economy (NOIE) has published a variety of resources aimed at assisting small business with the transition to E-commerce. In an *E-business Guide: An Australian Guide to Doing Business Online* NOIE (2003) estimates the current establishment cost of a database driven web site (a non-redundant site with backend integration) at around \$45K. In a sequence of case studies attached to the site, NOIE reports establishment budgets in the range \$5K-\$15K, for sites with low or no backend integration.

When client data acquisition using forms is supported via a user interface, Web database enables online community and personalization to be pursued as part of strategy to transform customer relations. Common implementations involve *forums* in which consumers can ask questions and be involved in Consumer-to-Consumer (C2C) communication. Forms can also be used to drive guest books where customers record comments about a service or product, affording vendors the opportunity for online equivalent of 'word of mouth' promotion. A study of consumer channel choice behaviour in tourism by Jung, Louveris and Oppewal (2002), found that in information searching about tourism product, word of mouth was a more important channel than

the Internet, which came second. Forms also provide opportunities for customer feedback on products or services (Amor, 2002).

Online community also facilitates the capture of identities enabling targeted promotion of product. In a 2000 study of online tourism in Australia, the Co-operative Research Centre for Sustainable Tourism (2000, p.15) found that:

The Australian tourism industry has not paid substantial attention to the uses of consumer and consumer communications to promote products and destinations. Being a very small market in international terms, Australia does not feature prominently on international tourism consumer and consumer communication initiatives. The Australian industry could certainly develop initiatives to facilitate consumer and consumer communications as the online equivalent of 'word of mouth' marketing.

Since successful online community depends on client content acquisition, technologies must be selected that enable such acquisition.

#### *3.3.4 Discovery: Role of metadata*

Metadata encoding of web pages based on metadata schemas such as Dublin Core has long been thought of as an essential element of discovery strategy (Amor, 2002; Tassabehji, 2003). Early generation search engines used metadata and keywords to index and rank pages. Web masters responded with strategies based on the location and frequency of keywords to improve indexing and page ranking.

However, the dominant player in the market place, Google, does not use meta-tags to index or rank pages. Rather than meta-tags, Google's page ranking and indexing algorithms rely upon the number and quality of links to a page in calculating its rank. Since Google technology now captures 'four out of five' Web searches (McHugh, 2003), whether meta-tags should be regarded as an important transformation criterion is open to debate. Search Engine Watch (2002) reports better meta-tag support for description than keywords, across search engines.

```

<HEAD>
<TITLE>Stamp Collecting World</TITLE>
<META name="description" content="Everything you wanted to know
about stamps, from prices to history.">
<META name="keywords" content="stamps, stamp collecting,
stamp history, prices, stamps for sale">
</HEAD>

```

**Figure 3.1 Meta-tagging of a Web Page (Brogan, 2004)**

In a review of crawlers (spiders) operated by the principal search engine solution providers, SearchEngineWatch (Sullivan, 2002a, p.1) found that only solution providers Inktomi and Teoma supported the keyword meta-tag. These companies 'power' three minor engine players – Hotbot, Ask Jeeves and Teoma.

The conclusion seems inescapable that meta-tagging now operates at the margin in terms of enhancing discovery prospects for a site. More important is search engine rank, the relative position of a site in the list of sites returned by a search engine in response to a user enquiry (Zhang & Dimitroff, 2005).

### *3.3.5 Discovery: Interconnection, search engine and traffic ranking*

In the most popular search engine in operation today (Google), meta-tags and keywords have been abandoned as the determinant of whether a site will be indexed and how it will be ranked in favour of another index of value - the number of pages that Link to a Page (L2P). SearchEngineWatch (Sullivan, 2002b, p.1) explains the logic of L2P in the following terms:

Crawler-based search engines have plenty of experience now with webmasters who constantly rewrite their web pages in an attempt to gain better rankings. Some sophisticated webmasters may even go to great lengths to "reverse engineer" the location/frequency systems used by a particular search engine. Because of this, all major search engines now also make use of "off the page" ranking criteria.

Off the page factors are those that a webmaster cannot easily influence. Chief among these is link analysis. By analyzing how pages link to each other, a search engine can both determine what a page is about and whether that page is deemed to be "important" and thus deserving of a ranking boost. In addition, sophisticated techniques are used to screen out attempts by webmasters to build "artificial" links designed to boost their rankings.

Google features a link: siteURL query that shows all the pages that point to a designated URL. The query operates only on URLs and cannot be linked to keywords. On Google, the number of pages that point to a target URL provides a base measure of the interconnectedness of the site with other sites involved in the industry/sector. Google's PageRank algorithm ranks a page according to its 'importance' measured in terms of the number and quality of pages that link to it. According to Google's Technology Page (Google, 2003, p.1):

PageRank relies on the uniquely democratic nature of the web by using its vast link structure as an indicator of an individual page's value. In essence, Google interprets a link from page A to page B as a vote, by page A, for page B. But, Google looks at more than the sheer volume of votes, or links a page receives; it also analyzes the page that casts the vote. Votes cast by pages that are themselves "important" weigh more heavily and help to make other pages "important."

Important, high-quality sites receive a higher PageRank, which Google remembers each time it conducts a search. Of course, important pages mean nothing to you if they don't match your query. So, Google combines PageRank with sophisticated text-matching techniques to find pages that are both important and relevant to your search. Google goes far beyond the number of times a term appears on a page and examines all aspects of the page's content (and the content of the pages linking to it) to determine if it's a good match for your query.

PageRank is positively associated with the results list position achieved by home pages. Since user behaviour involves movement between sites via links following cognitive patterns of association, discovery is enhanced by a strategy for connection based on links implemented at subject related sites.

In December 2004, SearchEngineWatch (Sullivan, 2005) estimated Google's share of the search market in the United States at 35% and rival Yahoo's market share at 32%. Thus, to measure interconnection via links reliably a research design must account for interconnection as measured by Google's main rival, Yahoo. Yahoo utilizes Overture search technology to power its own and other minor search engine players (Sullivan, 2004, p.1). One such player is AlltheWeb, which provides a link: siteURL link popularity

measurement service based on the Yahoo/Overture database (Creative Software Systems, 2004).

The traffic a site generates can be attributed to many factors, including E-strategy measures taken to optimize search engine visibility. However, historically, the confidentiality of access logs and other sources of traffic web metrics have prevented comparative analysis of traffic patterns across firms operating within an industry/sector. This situation changed with development in 1996 of a suite of services known as the Alexa Toolbar by US Internet applications developer Alexa Internet. At the time of writing in release 7, the Alexa toolbar logs data describing domains visited and pages viewed on the client for submission and anonymous analysis by Alexa. Since its inception, the Alexa toolbar has expanded to encompass several million users and is regarded as an important source of competitive intelligence on the ability of companies to attract traffic in terms of market share.

Alexa's traffic Rank (Alexa, 2003, p.1) is "based on three months of aggregated historical data" and is "a combined measure of page views and users (reach)." According to Alexa (ibid):

The main Alexa traffic rank is based on the geometric mean of these two quantities averaged over time (so that the rank of a site reflects both the number of users who visit that site as well as the number of pages on the site viewed by those users).

Acknowledged limitations (Alexa, 2003, p.1) of the Toolbar concern cultural bias in the user base, browser and platform support, and unreliability of rankings above one hundred thousand (100,000). Subject to these limitations Alexa can be used as an independent source of verification of traffic flows, and hence as a measure of effectiveness of E-strategy and technological capability.

### *3.3.6 Channels and mobile commerce*

The conduct of E-commerce over fixed wired connections is no longer inevitable and the wireless Internet has become the subject of a race to



develop new business models that exploit the potential of ubiquitous computing. Technology options include, but are not restricted to:

- simple text messaging (SMS) protocol interfaces;
- voice over IP and Internet Telephony;
- Wireless Applications Protocol (WAP); and
- Third Generation (3G) telephony using Multimedia Messaging Protocols.

From the delivery of Location Based Services (LBS) utilizing GPS data sets to text messages delivered over GSM mobile phones, ubiquitous computing affords many new opportunities for tourism businesses to leverage from online activity. This potential was first identified in 2000 by the Commonwealth's Department of Industry, Science and Resources in a landmark report on the significance of the Internet for the industry. In Tourism Dotcom, the Department argued (DISR, 2000, p.4) that online activity should be thought of as encompassing:

*all internet or internet-related technologies. While obvious examples of this include web site and e-mail communication, there is a vast array of other applications relevant to tourism. These include, for example, Wireless Application Protocol (WAP), internet kiosks, internet telephony and internet protocol (IP) faxing.*

These and other innovative internet applications hold considerable promise for the tourism industry, but are only the tip of the iceberg in terms of the internet's potential. It is vital that tourism businesses be aware of new applications and how they might be used to benefit product marketing, business communication and sales to consumers.

As discussed in section 2.3.4.5, the emergence of M-commerce based systems is seen as a critical development in eTourism (Buhalis, 2003; Benjamin, 2003; Oertels, 2002; Kanerva, 2004; Strangeways, 2003). By 2003, LBS had become a theme area in the CRC for Sustainable Tourism Research Agenda (CRC, 2003, p.1). However, the European tourism industry is a current world leader in

the application of mobile data systems to tourism. Benchmark projects include:

- Project PALIO<sup>16</sup>- A project that aims to provide services that are directly available for tourists and citizens by developing and implementing complex data systems with user-friendly and personalised interfaces;
- Project CRUMPET<sup>17</sup>- A project that trialed tourism related value-added services for nomadic users across mobile and fixed networks and evaluated agent technology in terms of user acceptability and performance. (Schmidt-Benz *et al.* 2003; Schmidt-Benz *et al.* 2002)

Kanerva (2004) describes an ambitious Finnish tourism M-commerce project known as *Pocket Traveler* which includes a destination planning tool, a virtual traveler's guide, a dynamic LBS traveler's directory, electronic voucher system and electronic wallet (fulfillment) system. The *Pocket Traveler* platform also plays host to leading edge new M-commerce tourism product, including HiTec Forest, an Ecotourism mobile personal guide and interactive gaming application (*ibid*, p.14).

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<sup>16</sup> Personalised Access to Local Information and services for tOurists (PALIO-IST 20656). Vide Andreadis, A. *et al.* (2001). *Universal Access to Personalised Information Services*. Retrieved 12 February, 2005 from <http://marconi.ltt.dii.unisi.it/~giambene/ist2001.pdf>.

<sup>17</sup> Creation of User-friendly Mobile Services Personalized for Tourism (CRUMPET). Vide Schmidt-Belz *et al.* (2003). Location Based Mobile Tourist Services: First User Experiences. *Proceedings of ENTER 2003: Tenth International Conference On Information Technology and Travel & Tourism – IFITT's Global Travel & Tourism Technology and eBusiness Forum*. Helsinki. 29th – 31st January 2003. 116-123.

### 3.3.7 Summary

This review of the literature on Technological Capability reflects on recent research and other publication that impacts on operationalization of the Technological Capability construct. The discussion is grounded in RBV thinking about the role of technology in securing competitive advantage (Affuah and Tucci, 2001; Straub and Klein, 2001; Lucas, 2002). Instrument design considerations include *point-of-presence*, *enabling technologies*, *discovery*, *channels* and *use of multimedia*.

Technological capability can be used to secure competitive advantage where the application of technology results in an inimitable resource or effective leveraging of complementary assets (Affuah and Tucci (2001); Tassabehji, 2003; Lucas, 2002). Enabling Internet technologies such as Web database and dynamic Web pages confer competitive advantages compared with static HTML/XHTML. When client data acquisition using forms is supported via a user interface, Web database enables online community and personalization to be pursued as part of strategy to transform customer relations.

*Infomediary* services (Hagel, 1996) such as industry portals and search engines can improve visibility and discovery opportunities (Small, 2000; Dittenbach, et al. 2004; Bowen, 2004), but can carry disadvantages in terms of costs, price competition and reduced opportunities for differentiation (Tassabehji, 2003; Harmon, Rosen and Guttman 2001; Kalakota and Robinson, 2001). For these reasons, firms optimally implement strategies and capabilities that emphasize the benefits of portals and inter-connection while minimizing the disadvantages. These strategies and capabilities include registered domains, Internet PoP, inter-connection and Search Engine Optimization (SEO). Technological capability based on M-commerce is rapidly emerging and is viewed as a critical development in eTourism (Buhalis, 2003; Benjamin, 2003; Oertels, 2002; Kanerva, 2004; Strangeways, 2003).

### 3.4 Construct operationalization: Strategic Business Transformation

In common with the *Technological Capability* dimension of the *Marketspace* model, significant changes have taken place in the theory and practice of business transformation since Dutta and Segev's original (2001) study. These changes must be taken into account when operationalizing *Business Transformation*. Discussion is organized by the transformation clusters represented in the Dutta and Segev (2001) model, i.e., Promotion, Product, Price, Place and Customer relationships. Two important changes, noted from recent management information systems literature on business transformation, concern 'co-operative competition' and 'online alliances'. Sections 2.1.7 and 2.2.2 explore this literature in the context of SME and SMTEs.

#### 3.4.1 Transformation of Promotion: Advertising, customization and alliances

De Waal (2004, p.32) describes five generic objectives that support the goal of facilitating customer ordering online of products and services:

1. Creating brand awareness and attracting first time visitors to a site;
2. Breaking down the site entry barriers;
3. Increasing site stickiness;
4. Converting visitors into buyers; and
5. Building on-going relationships (achieving repeat business).

Objective 1 involves the methods, techniques and technologies of online promotion. Dutta and Segev (2001) in their work on the promotional quadrant of the *Marketspace* model identified promotional opportunities in *discounts and special offers, promotion customization and online customer participation in promotion* (the online equivalent of word of mouth). Notably missing from this work is online alliance partnering and affiliate advertising.

These issues are taken up by De Waal (2004, p.34) who adds to the list of promotional tactics *banners, popUps, affiliate advertising, search engines and directories*. Pioneered by Amazon.com, Papatla and Bhatnager (2002, p.69) argue that affiliate advertising “offers an excellent way of targeting banner ads.” Creating brand awareness involves both offline and online promotional tactics (De Waal, 2004, p.33). In the first instance, “irrespective of the firm’s other brands, the *domain name* now essentially becomes the firm’s online brand.” (Wilsonweb 2004) *Internet direct marketing* has also burgeoned. From unsolicited email in the form of ‘spam’ delivered across fixed wire connections to SMS protocol wireless messaging, the harvesting of identity information has created promotional channels and opportunities (De Waal, 2004).

Inspired by market successes enjoyed by ISO 9000 companies in the early phase of the quality movement, online branding and accreditation has emerged as an element of online promotional strategy. In the Australian Ecotourism industry, an industry accreditation service is provided by industry peak body Ecotourism Australia, in the form of The Nature and Ecotourism Accreditation Program.<sup>18</sup> Accredited firms are entitled to carry the Ecotourism Australia logo in promotional materials. Shukla and Pather (2004, p.303) attribute to endorsements and membership of professional associations a role in the cultivation of consumer trust, an important constituent of E-commerce customer satisfaction.

#### 3.4.2 Transformation of Products: Online directory of products and services

Nielsen recognized ‘utility’ as an essential complementary characteristic to ‘Usability’ (Hoffman, 2002). A site has utility if it meets user goals or expectations that brought the user to the site. Content and copywriting are an

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<sup>18</sup> Ecotourism Australia. (2003). *About Ecotourism Australia*. Retrieved 20 July, 2003 from <http://www.Ecotourism.org.au/abouteaa.cfm>.

important determinant of utility and regarded by some researchers as the most important component of web design (Amor, 2002; Treese and Stewart, 2003; De Waal, 2004). Kahn *et al.* (2002) describes content quality issues concerning accessibility, the extent of information provided, its credibility, completeness, concise representation, objectivity, relevance, reputation, security, timeliness and understandability. In another study, Ody (2000), argues that the customers use the Internet to find information or to buy a product or service for reasons of speed and convenience. These findings suggest factors in information organization (see section 3.2) and the extent and quality of information provided in catalogs and products and directories.

Nielsen (1998) argues that information and services should be 'better than reality':

Instead of impoverished facsimiles of reality, design from a basis of strength and go beyond reality to things that are impossible in the physical world. It is painful to use the Web, so we need to reward users: give them something new and better that they didn't get before.

Dutta and Segev (2001, p.18) agree, arguing that firms must "exploit the unique transformational potential of the Internet" and rise above "simply treating the Internet as a publishing medium."

Tactics available to site owners to achieve 'better than reality' are concentrated in the *Technological Capability* dimension. The literature of vividness, interaction and simulation describe technology and design possibilities for the achievement of 'better than reality'. The research literature on these factors is discussed in section 2.3.4.1.

#### 3.4.3 Transformation of Place: Online ordering and fulfillment

Accommodation and tours are bookable products. Web site support for online ordering and fulfillment offers the following advantages to owner/operators:

- efficiency and productivity savings, particularly where this functionality is integrated with backend databases; and
- reduced costs compared with portal and directory sales where operators pay per transaction and subscription fees to intermediaries.

Evidence gathered by Gratzner and Winiwater (2004) suggests the importance of online fulfillment in boosting online transactions. In a survey of Austrian tourist accommodation providers ( $n=7500$ ;  $r=297$ ), Gratzner and Winiwater claimed a significant difference ( $p=0.016$ ) in online bookings between surveyed firms that supported fulfillment on their web sites and those that did not support fulfillment (*ibid*, p.13).

Online ordering and fulfillment are categorized as Stage 3 functions in the *eMICA Model*, i.e., characteristic of the tertiary phase of E-commerce adoption. In B2C E-commerce, the ability to implement online ordering and fulfillment is an important source of E-competitive advantage.

#### 3.4.4 Customer relations transformation: Personalization, Community and Trust

Much of the potential for business transformation on the Internet is bound up in its potential to transform customer relations. Factors such as customer service, relationships, community, brand and trust form *complementary assets* (Affuah and Tucci, 2001) that can also be leveraged by technology to provide the basis of competitive advantage. In their own review of business transformation on the Internet, Straub and Klein (2001) concluded:

With the advent of e-commerce, especially the Net, traditional information asymmetry has been redefined to consider how a firm seizes an advantage over its competition by knowing more about its customers' needs. In moving from strategic necessity to e-competitive transformation, the key difference is the shift from inexperienced - customers - but - knowledgeable - firms to knowledgeable - customers - but - imperfectly - informed - competitors. As consumers take advantage of their newfound access to information, firms must position themselves to strengthen customer relationships.

Customization (Bonnet, 2001, p.2):

occurs when the user can configure an interface and create a profile manually, adding and removing elements of the profile. The control of the look and/or content is explicit and is user driven, i.e., the user is involved actively in the process and has control.

The goal of customization is to improve the user's experience of a service by enabling them to shape the online experience according to personal requirements. Customization can extend to user input in the specification of a product or service. For example, computer hardware vendors specializing in online retailing widely support user specification of systems inclusive of graphics and sound cards, networking, media and peripherals.<sup>19</sup> An important element of customization in tourism applications is "localization" (Amor, 2002, p.195), the process of adapting a product to meet the language, cultural and other requirements (e.g., bandwidth) of a target environment or market (a locale).

Web applications development is increasingly customer centric (Nelson and Nelson, 2002). Through personalization of web content and services, businesses can transform customer relations (Amor, 2002; Tassabehji, 2003; Treese & Stewart, 2003; Kalakota and Robinson, 2001). Personalization and customization (De Waal, 2004) can also serve to enhance site stickiness. In the tourism domain, research by Gratzner and Winiwarter (2004) revealed a significant difference ( $p=0.033$ ) in online bookings between surveyed firms that supported personalization on their web sites and those that did not support personalization.

Online community as a CSF was discussed in 2.1.9. In the tourism domain, a significant literature exists pointing to the value of online community as an

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<sup>19</sup> At the time of writing, the most successful vendor in the systems market place offering this capability was Dell Computer. *Vide* Dell's home page at:

<http://www.ap.dell.com/ap/au/en/gen/default.htm> (20 July, 2003)



element of online strategy (Dellaert, 1999; Antonioli and Baggio, 2002a, 2002b). The tools used to provide community services are described by Long and Baecker (1997) and include *email, newsletters, boards, forums and chat*. In a study of virtual community in the Italian tourism industry, Corigliano and Baggio (2003, p.94) claim to have found empirical evidence “that sites that use these tools, even at moderate level, have higher amounts of visitors and pages viewed.”

Trust is a multi-faceted construct. The impact of trust on consumer behaviour and E-commerce performance is the subject of a substantial literature (McKnight *et al.* 2002; Suh 2003; Ba *et al.* 2002; Gefen 2003; Pavlou 2003). In operationalizing trust, facets such as a secure transaction environment (Items 8.6.2-8.6.3) (McKnight *et al.* 2002; Suh 2003) and the availability of privacy policy (Item 8.6.1)(Standards Australia, 2001; NOIE, 2004; Vuori *et al.* 2004) loom large in the literature on best practice in E-commerce adoption.

### 3.5 Conclusion

This Chapter has presented the research literature that bears upon research design for a study that has as its main aim, the investigation of Cyber transformation theory and the Marketspace model. Specifically, it has investigated the research literature connected with construct operationalization of the model described in Figure 2.7 and provided an account of factors that need to be considered in the design of scales and quasi-experimental components. Importantly, it has provided an account of factors in Usability, Technological Capability, Business Transformation and Customer Relationships that need to be addressed in the interests of ensuring domain validity. Some of these factors were present in the original Dutta and Segev (2001) scale. Others have been suggested by recent CSF research including work by De Waal (2004) on Internet Marketing and Shukla and Pather (2004) on E-commerce customer satisfaction. In *Chapter Five*, the Research Methods

and Design, this discussion is revisited in the explanation of scale and quasi-experimental design.

## 4 Research questions and hypotheses

### 4.1 Overview

This thesis investigates the phenomenon of E-commerce adoption, through the lens of Dutta and Segev's (2001) *Cyber transformation theory* and the *Marketspace* model on which this theory is based. Cyber transformation theory holds that successful E-commerce adoption requires that business models and processes be *transformed* for cyber space. The required transformation is two-dimensional based on a concept of *Marketspace* embracing the dimensions of:

- *Technological capability* (based on the facets of Interactivity and Connectivity); and
- *Business strategy* constructed around the factors of *Products, Prices, Promotion and Placement* (recognizable as the four Ps of the traditional market model) and Customer relations.

Cyber transformation theory is one of a number of competing theories that attempt to explain E-commerce adoption. *Chapter Two* explains reasons for the choice of Cyber transformation theory as a starting point for this investigation of E-commerce adoption. The study also involves deployment of a Cyber transformation portal quasi-experiment in a C-commerce setting. This experiment is also the subject of a research question that focuses on the role of SME networks in Cyber transformation innovation.

### 4.2 Aims and objectives

An important objective of this research is to determine whether *Cyber transformation theory* and the *Marketspace Model* can be validated by E-commerce value creation outcomes achieved in an industry that displays

good product fit to the Web channel. The proposed research involves two constructs:

- Cyber transformation; and
- E-commerce value creation.

*Cyber transformation* is a multi-dimensional construct based on *Marketspace Model* dimensions of *Technological capability* and *Business strategy*; and the latter, *E-commerce value creation*, is also multi-dimensional involving traditional business and online, or so-called E-measures.

A secondary research objective is to investigate the contribution of particular clusters of factors within the *Marketspace Model* and their relationship with *E-commerce value creation* outcomes. One such factor, E-strategy, has already been researched independently by Golden, Hughes and Gallagher (2003, p.8) and found to be related to two E-commerce value creation measures (sales leads generated and hits per week). Depending on the outcome of the primary investigation, data analysis and interpretation may suggest an alternative theory and/or model that might explain patterns observed in survey data. Specific questions and related hypotheses are discussed below.

#### *4.3 Extent of cyber transformation in a sample of firms*

The postulated relationship between cyber transformation outcomes and E-commerce value creation outcomes forms a focal relationship for this study. Empirical investigation of such a relationship necessarily involves a sample of firms for which the Cyber transformation and E-commerce value outcome parameters will be measured. To improve the validity and reliability of relationship testing, it is proposed to carry out this measurement in an industry/sector where *product fit* exists for B2C mode E-commerce. However, *product fit* is only one of a number of possible control independent variables that might affect the magnitude of any association found between the focal

variable (Cyber transformation) and the dependent variable (E-commerce value). How such variables contribute to spuriousness and measures adopted to reduce their impact are discussed in detail in *Chapter Five*.

The first Research Question (RQ) concerns Cyber transformation adoption in the industry/sector selected for the study:

RQ1: To what extent do Australian SMEs in an industry with good product fit to the Web channel demonstrate Cyber transformation?

*Chapter Two* revealed a research literature (ABS, 2002b; Bode, 2002, Braun, 2003) suggesting that low-level cyber transformation is typical of Australian SMEs and it is therefore expected that this result will be replicated in the current study:

H<sub>1</sub>: Cyber transformation is low.

Such a result would be confirmed if Cyber transformation scores were found to display a *mean* significantly less than the scale mid point.

Cyber transformation achieved by firms, is also expected, *a priori*, to be positively related to firm size and turnover:

H<sub>2</sub>: Cyber transformation achieved is positively related to firm size and turnover.

#### *4.4 Relationship between Cyber transformation and E-commerce value outcomes*

The theory and model under investigation are grounded in the idea that successful E-commerce adoption proceeds from business model transformation to take advantages of features of the Web channel that can be

used to secure E-competitive advantage in strategically important areas such as sales, marketing, distribution and customer relations. The *Marketspace* model grounds E-strategy formation in the Four Ps of the *Marketspace* supplemented by customer relations.

The relationship between Cyber transformation ( $X_i$ ) and E-commerce value creation ( $Y$ ) is a focal relationship for this component of the study. If the theory and model are valid, then it is expected that superior Cyber transformation outcomes will be related to E-commerce value creation outcomes. The possibility also exists that transformation along particular axes or clusters within the model may also exhibit such a relationship. The research therefore aims to discover:

RQ2: What relationship, if any, exists between increasing Cyber transformation and E-commerce value creation outcomes?

E-commerce value creation is a multi-dimensional construct involving traditional financial and so-called new economy or E-measures.<sup>20</sup> Four measures originating in the Golden *et al.* (2003) and Barua *et al.* (2001) studies display domain validity for an E-commerce adoption study aimed at exploring association between cyber transformation and E-commerce value creation:

- Return on Investment (ROI) in online;
- Percentage of revenue earned online;
- Percentage of new customers acquired online; and
- Number of sales leads generated by online.

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<sup>20</sup> Vide Section 2.4.4, p.87.

Individually and collectively, the following hypotheses based on these measures are expected, when tested, to shed light on RQ2:

H<sub>3.1</sub>: Return on Investment in online is positively related to Cyber transformation outcomes.

H<sub>3.2</sub>: Percentage of revenues earned online is positively related to Cyber transformation outcomes.

H<sub>3.3</sub>: The number of sales leads generated by online is positively related to Cyber transformation outcomes.

H<sub>3.4</sub>: The percentage of new customers acquired online is positively related to Cyber transformation outcomes.

Hypotheses H<sub>3.1-3.4</sub> describe the focal relationship of this study, i.e., the relationship between Cyber transformation based on the *Marketspace Model* and E-commerce value creation. Each hypothesis is of the form  $H: \rho > 0$ , i.e. the measure is positively correlated with Cyber transformation. This is to be tested with a fit of the data to the corresponding null hypothesis,  $H: \rho = 0$ , i.e. for each of the four measures, there is no association between Cyber transformation outcomes and the measure. If the null hypothesis is rejected, then it is concluded that the corresponding measure is positively correlated with Cyber transformation. A *prima facie* case will have been demonstrated that firms achieving superior transformation outcomes online are likely to be rewarded by improved E-commerce value creation outcomes.

#### 4.5 Role of other independent variables in E-commerce value creation

By explicitly testing the proposition of early adopter advantage, it is expected that E-commerce value creation outcomes across each of the four measures will be found to be related to program longevity. The set of hypotheses to be tested comprises H<sub>4.1-4.4</sub>:

H<sub>4.1-4.4</sub>: Firms enjoying early adopter advantage achieve superior Return on Investment (H<sub>4.1</sub>), Revenue (H<sub>4.2</sub>), Sales leads (H<sub>4.3</sub>) and New Customer (H<sub>4.4</sub>) E-commerce value creation outcomes.

It is also expected that positive association will be found to exist between E-commerce budgets and each of the four E-commerce value creation measures. The set of hypotheses to be tested comprises H<sub>5.1-5.4</sub>:

H<sub>5.1-5.4</sub>: Return on Investment (H<sub>5.1</sub>), Revenue (H<sub>5.2</sub>), Sales leads (H<sub>5.3</sub>), and New Customer (H<sub>5.4</sub>), are positively related to E-commerce budgets.

#### 4.6 Dimension and cluster analysis of transformation and E-commerce value creation outcomes

Whether or not testing of H<sub>3.1</sub>-H<sub>3.4</sub> enables rejection of the null hypothesis, transformation cluster relationships may exist with various kinds of E-commerce value creation outcomes. If such relationships could be found, then this would provide valuable evidence for where businesses should direct strategy in E-commerce adoption. In this sense, the proposed research aims to answer the question of:

RQ3: Which *dimensions* of transformation and, which *clusters* within these dimensions, are important in determining E-commerce value outcomes?

A number of hypotheses are suggested as a consequence. The first group concerns the *Technological capability* dimension of the *Marketspace Model*:

H<sub>6.1</sub>: Return on Investment in online is positively related to *Technological capability (Interactivity and connectivity)* transformation outcomes.

H<sub>6.2</sub>: Percentage of revenues earned online is positively related to *Technological capability (Interactivity and connectivity)* transformation outcomes.



H<sub>6.3</sub>: The number of sales leads generated by online is positively related to *Technological capability (Interactivity and connectivity)* transformation outcomes.

H<sub>6.4</sub>: The percentage of new customers acquired online is positively related to *Technological capability (Interactivity and connectivity)* transformation outcomes.

Within *dimensions*, Cyber transformation theory describes *clusters* of transformation criteria. Clusters are logical groupings of criteria organized around sub-constructs. In the original model, sub-constructs were developed for the *Strategic business dimension*. However, there was no cluster organization of the *Technological capability* dimension, reflecting its treatment as a uni-dimensional construct based on a handful of items (argued in *Chapter Two* to be a potential source of invalidity).<sup>21</sup>

*Chapter Five* describes a revised scale for the testing of Cyber transformation theory that facilitates validation testing of the original theory and model. The scale contains additional clusters and items that reflect changes to the technology and knowledge base on E-commerce adoption since 2001. These changes are grounded in the literature that concerns construct operationalization and are discussed in the literature review on research design forming *Chapter Three*.<sup>22</sup>

The following clusters have been identified in the *Technology capability (Interactivity and Connectivity)* dimension:

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<sup>21</sup> Vide Section 2.5.3, p.90.

<sup>22</sup> Vide Chapter Three, p.95.

1. Architecture and Internet Enabling Technologies;
2. Discovery;
3. Interactivity and Simulation;
4. Multimedia (Vividness); and
5. Channels.

The related hypothesis sets are:

H<sub>7.1-7.4</sub>: Return on Investment (H<sub>7.1</sub>), Revenue (H<sub>7.2</sub>), Sales leads (H<sub>7.3</sub>) and New Customer (H<sub>7.4</sub>) E-commerce value creation outcomes are positively related to site Architecture and Internet enabling technologies.

H<sub>8.1-8.4</sub>: Return on Investment (H<sub>8.1</sub>), Revenue (H<sub>8.2</sub>), Sales leads (H<sub>8.3</sub>) and New Customer (H<sub>8.4</sub>) E-commerce value creation outcomes are positively related to discovery outcomes.

H<sub>9.1-9.4</sub>: Return on Investment (H<sub>9.1</sub>), Revenue (H<sub>9.2</sub>), Sales leads (H<sub>9.3</sub>) and New Customer (H<sub>9.4</sub>) E-commerce value creation outcomes are positively related to the use of interactivity and simulation in site design.

H<sub>10.1-10.4</sub>: Return on Investment (H<sub>10.1</sub>), Revenue (H<sub>10.2</sub>), Sales leads (H<sub>10.3</sub>) and New Customer (H<sub>10.4</sub>) E-commerce value creation outcomes are positively related to Multimedia (Vividness).

H<sub>11.1-11.4</sub>: Return on Investment (H<sub>11.1</sub>), Revenue (H<sub>11.2</sub>), Sales leads (H<sub>11.3</sub>) and New Customer (H<sub>11.4</sub>) E-commerce value creation outcomes are positively related to the use of *Internet channels* in destination planning, customer relations and product distribution.

In regard to H<sub>9.1-9.4</sub> & H<sub>10.1-10.4</sub>, *Chapter Two* reviewed the literature on the importance of interactivity, simulation and vividness in online consumer behaviour. This literature appears inconclusive, demonstrating the difficulty posed to researchers of determining the effect of these variables on consumer behaviour, net of the role of other control variables such as *usability*, *the value proposition*, *E-readiness* and so on.

H<sub>8.1-8.4</sub> provides the basis for an investigation of the importance of *resource discovery* in E-commerce adoption. As discussed in *Chapter Two*, resource discovery is not a feature of Dutta and Segev's (2001) theoretical description of Cyber transformation, an observation grounded in the fact that *Connectivity transformation* was not operationalized in the scale adopted as the basis of their empirical study of E-commerce Web sites. Failure to operationalize *Connectivity transformation* is illustrative of a wider validity issue concerning the domain of Cyber transformation: the work of Dutta and Segev (2001) predicates a locus of transformation (the Web site) that excludes portals, directories and other places of *Connectivity transformation*.

Bivariate and multivariate testing of H<sub>8.1-8.4</sub> is expected to shed light on the importance of discovery strategy in E-commerce adoption. The contribution of *Internet channels* to E-commerce value creation (H<sub>11.1-11.4</sub>) is to be explored through investigation of E-value creation outcomes achieved by firms that have adopted M-commerce and also through a quasi-experimental component of the design that provides an M-commerce capability to firms participating in the experiment. *Chapter Five* provides an explanation of the portal quasi-experimental component of the study.

The Dutta and Segev (2001) model also specifies a *Strategic Business* dimension of the model. The hypothesis set H<sub>12.1-12.4</sub> provides a basis for inference testing for association between *Strategic Business* transformation and E-Commerce value creation:

H<sub>12.1</sub>: Return on Investment in online is positively related to *Strategic business* transformation outcomes.

H<sub>12.2</sub>: Percentage of revenues earned online is positively related to *Strategic business* transformation outcomes.

H<sub>12.3</sub>: The number of sales leads generated by online is positively related to *Strategic business* transformation outcomes.

H<sub>12.4</sub>: The percentage of new customers acquired online is positively related to *Strategic business* transformation outcomes.

In common with the *Technological Capability* dimension, the contribution of clusters within the *Strategic Business* dimension to E-value creation outcomes is also set for examination. The following transformation clusters are represented in the model:

- Products;
- Promotion;
- Price;
- Place; and
- Customer relations.

The related hypothesis set is:

H<sub>13.1-13.4</sub>: Return on Investment (H<sub>13.1</sub>), Revenue (H<sub>13.2</sub>), Sales leads (H<sub>13.3</sub>) and New Customer (H<sub>13.4</sub>) E-commerce value creation outcomes are positively related to Product transformation.

H<sub>14.1-14.4</sub>: Return on Investment (H<sub>14.1</sub>), Revenue (H<sub>14.2</sub>), Sales leads (H<sub>14.3</sub>) and New Customer (H<sub>14.4</sub>) E-commerce value creation outcomes are positively related to Promotion transformation.

H<sub>15.1-15.4</sub>: Return on Investment (H<sub>15.1</sub>), Revenue (H<sub>15.2</sub>), Sales leads (H<sub>15.3</sub>) and New Customer (H<sub>15.4</sub>) E-commerce value creation outcomes are positively related to Price transformation.

H<sub>16.1-16.4</sub>: Return on Investment (H<sub>16.1</sub>), Revenue (H<sub>16.2</sub>), Sales leads (H<sub>16.3</sub>) and New Customer (H<sub>16.4</sub>) E-commerce value creation outcomes are positively related to Place transformation.

H<sub>17.1-17.4</sub>: Return on Investment (H<sub>17.1</sub>), Revenue (H<sub>17.2</sub>), Sales leads (H<sub>17.3</sub>) and New Customer (H<sub>17.4</sub>) E-commerce value creation outcomes are positively related to Customer relations transformation.

#### 4.7 Effect of Usability on E-commerce value outcomes: Bivariate and Multivariate analysis

*Chapters Two and Three* described how E-commerce value creation outcomes might depend upon site *Usability*.<sup>23</sup> Usability is one of a number of control variables that might affect association in the focal relationship. The role of these variables and their impact on research design is discussed in *Chapter Five*.<sup>24</sup>

Two sets of hypotheses will be tested:

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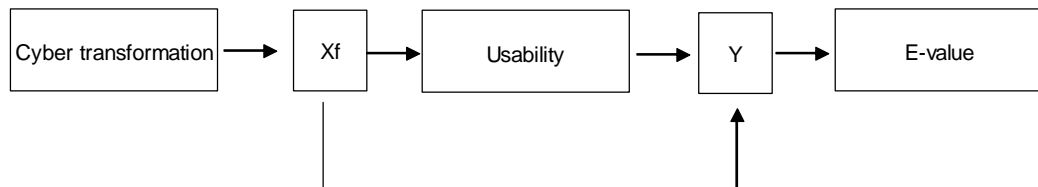
<sup>23</sup> Vide Sections 2.3.4.2, p.69 and Section 3.2, p.96.

<sup>24</sup> Vide Section 5.3.1, p.148.

H<sub>18.1-18.4</sub>: Return on Investment (H<sub>18.1</sub>), Revenue (H<sub>18.2</sub>), Sales leads (H<sub>18.3</sub>) and New Customer (H<sub>18.4</sub>) E-commerce value creation outcomes are positively related to Usability.

H<sub>19.1-19.4</sub>: In association with Cyber Transformation, Return on Investment (H<sub>19.1</sub>), Revenue (H<sub>19.2</sub>), Sales leads (H<sub>19.3</sub>) and New Customer (H<sub>19.4</sub>) E-commerce value creation outcomes are related to Usability.

How *Usability* might function as an *intervening* variable in the focal relationship is shown in Figure 4.1:



**Figure 4.1 Usability as an Intervening Variable (Brogan, 2004)**

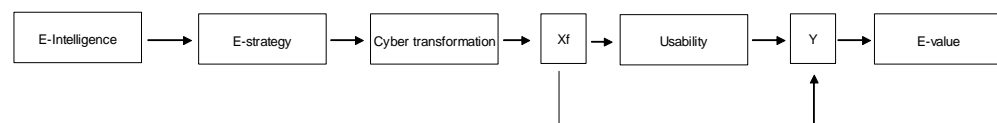
#### 4.8 E-strategy & E-intelligence

As *Chapter Two* describes, a significant literature exists (Straub and Klein, 2001; Evans and Wurster, 1999; Small, 2000; Dutta and Segev, 2001) that explains competitive advantage online in terms of strategy. It is therefore expected that firms with formal E-strategies (including business plans) will achieve higher order transformation outcomes. In this sense, the current research is expected to offer confirmation of the Golden, Hughes and Gallagher (2003, p.8) finding that E-business strategy is related to E-commerce success. The set of hypotheses to be tested comprises H<sub>20.1-20.4</sub>:

H<sub>20.1-20.4</sub>: Return on Investment (H<sub>20.1</sub>), Revenue (H<sub>20.2</sub>), Sales leads (H<sub>20.3</sub>) and New Customer (H<sub>20.4</sub>) E-commerce value creation outcomes are positively related to E-strategy adoption.

Whether *E-intelligence* operates to improve E-commerce value creation outcomes is also an important question. *E-intelligence* describes the capability of a firm to deploy *E-metrics* generated from data mining of server logs and other resources in E-strategy decision making. The role of E-intelligence in E-strategy formation is that of an input or *antecedent* variable.

The following diagram describes the association of E-Strategy and E-intelligence in terms of the focal relationship:



**Figure 4.2 E-intelligence and E-strategy in E-commerce value Creation  
(Brogan, 2004)**

This discussion suggests a further hypothesis set to be tested:

H<sub>21.1-21.4</sub>: Return on Investment (H<sub>21.1</sub>), Revenue (H<sub>21.2</sub>), Sales leads (H<sub>21.3</sub>) and New Customer (H<sub>21.4</sub>) E-commerce value creation outcomes are positively related to E-intelligence.

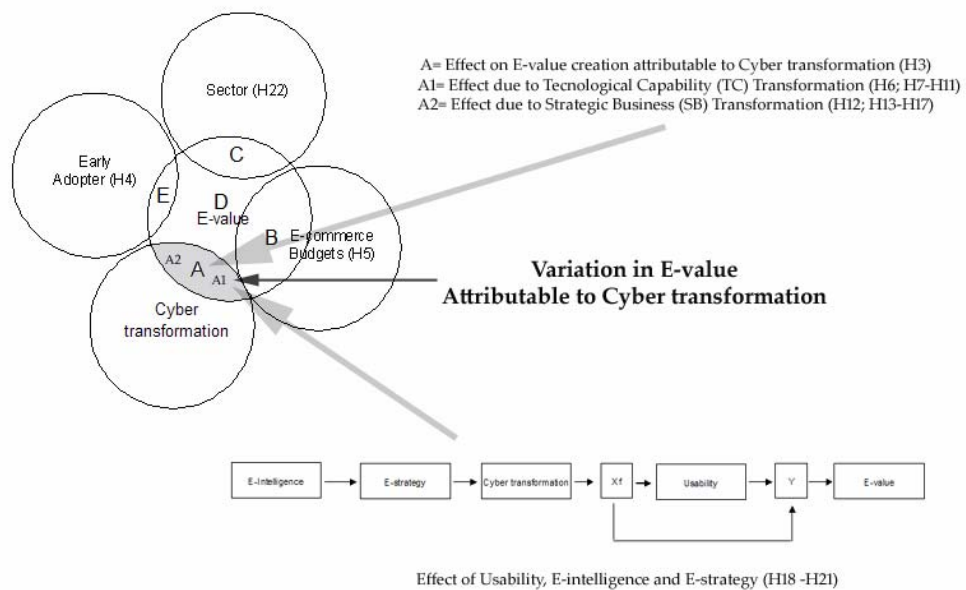
#### 4.9 Sector effect on E-value creation outcomes

*Chapter Two* describes research (Kiang *et al.* 2000; Peterson *et al.* 1997) suggesting that the characteristics of some goods and services are better suited to E-retailing than others. In tourism, product differentiation can be understood in terms of *sectors* based on product *type* (e.g., *accommodation, tours and attractions*). Hypothesis set H<sub>22</sub>, was devised to check for association between sectors and E-value creation outcomes:

- H<sub>22.1</sub>: Return on Investment in online is related to industry sector.
- H<sub>22.2</sub>: Percentage of revenues earned online is related to industry sector.
- H<sub>22.3</sub>: The number of sales leads generated by online is related to industry sector.
- H<sub>22.4</sub>: The percentage of new customers acquired online is related to industry sector.

Figure 4.3 maps the hypothesis set to *control*, *independent* and *intervening* variables that determine E-commerce value creation:

#### Control and Independent Variables



**Figure 4.3 Independent, control and intervening variables and Research Hypotheses (Brogan, 2004)**



#### 4.10 Evaluation of Cyber transformation theory and the Marketspace Model

The testing of hypothesis sets  $H_3$  and  $H_6$ - $H_{17}$  is expected to enable reflection on:

RQ4: How useful is Cyber transformation theory as an explanation for E-commerce adoption?

*Chapter Two*, describes the nature and role of Cyber transformation theory in E-commerce adoption research. It remains, through empirical study, to determine if the theory and model demonstrate good association with E-commerce value creation outcomes, i.e., whether observations correspond to theory based expectations. As *Chapter Four* explains, this investigation will be undertaken using the methods and techniques of *theory based data analysis* (Aneshensel, 2002), an iterative investigatory method that can be used to derive alternative theories should the predicted relationship not be demonstrated. Data analysis and interpretation involves association investigation using the methods of bivariate and multivariate statistical analysis.

#### 4.11 The role of information flows and networks

*Chapter Two* describes work by Freeman (1991), Rogers (1995) and Uzzi (1996) that pointed to the significance of social and knowledge networks in the diffusion of economically significant innovations. *Chapter Two* also describes a developing SME and tourism domain specific (SMTE) research literature on the operation of social and knowledge networks (Braun, 2003; Pavlovich, 2003; Wilson, 2002; Micela, Roberti and Jacuzzi; 2002; Rowe, 2004; Waslon, 2002). The last of the research questions is aimed at exploring the role of networks in the diffusion of Cyber transformation innovation of the kind attempted in the portal quasi-experiment:

RQ5: What role do networks play in collaborative Cyber transformation innovation in an SMTE network?
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This research is to be undertaken in the case study context of the quasi-experimental group network inclusive of portal adopters and their E-commerce advisors. The principal objective of the research is to determine information and knowledge flows in this network and how these flows may have contributed to Cyber transformation outcomes. *RQ5* is predicated on the *working hypothesis* grounded in the literature that networks contribute to innovation outcomes, but no specific hypotheses are proposed for testing, rather the research will be exploratory in character.

## 5 Research Methods and Design

### 5.1 Methods and design overview

The research design adopted for the study is a rich one, involving two surveys and a quasi-experimental Web portal. This combination of methods comprising a scale, survey and an experiment describes an approach based on 'triangulation' (Sarantakos, 1998, p.168). The portal was conceived as a proof of concept test-bed for Cyber transformation theory involving an M-commerce capability, furnishing the basis of an *imitable resource* (Affuah and Tucci 2001; Tassabehji, 2003; Lucas, 2002). The quasi-experimental portal was administered in a natural setting involving industry partners. The portal quasi-experiment is discussed in section 5.5. A quasi-experiment is an experiment conducted under field conditions outside the context of laboratory controls and where the "practice and real usage of a system" are primary subjects for investigation (Cook & Campbell 1979, O'Hara 1999). Limitations of research methods and design are discussed in section 5.8.

Methods employed in the study include the collection, analysis and interpretation of both *quantitative* and *qualitative* data.

*Quantitative* data collection and analysis is based on the administration of two survey instruments, namely, a *B2C Cyber transformation Scale*<sup>25</sup> and an *E-commerce Adoption Survey*.<sup>26</sup> Procedures in construction of these instruments are described in section 5.4. The target population and sample frame for the surveys are discussed in section 5.2. The Literature Review *Chapters Three* and *Four* describe issues in construct operationalization and metric selection that

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<sup>25</sup> Vide Appendix I: B2C Cyber transformation Scale

<sup>26</sup> Vide Appendix II: E-commerce Adoption Survey

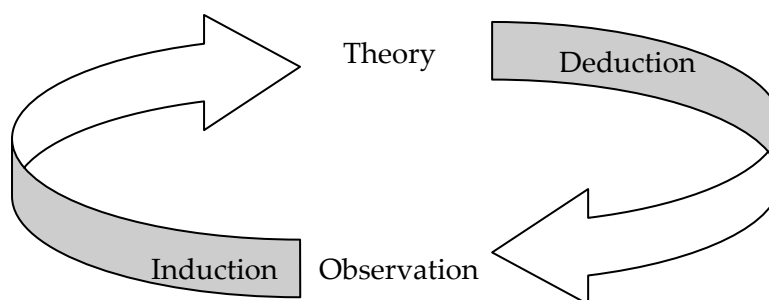
underpin instrument design. *Chapter Six*, the Pilot Study, describes precautions taken to ensure the validity and reliability of instruments used.

The application of quantitative methods in this way is aimed at exploring two parameters in the target population that are at the core of the research:

- the parameter of *Cyber transformation* (measured as an ordinal value, i.e., a percentage rank); and
- the parameter of *E-commerce value* (comprising scale data).

The relationship between Cyber transformation and E-commerce value creation forms a focal relationship for the study. If Cyber transformation theory and the *Marketspace Model* form a useful explanation of E-commerce adoption, then it is expected that statistically significant association will be observed in the survey population between Cyber transformation and E-commerce value creation outcomes. In this manner, and through re-visitation of theory in the light of empirical testing, the study employs the classic methods of *theory based data analysis* (Aneshensel, 2002) to explore the nature and significance of cyber transformation theory.

Theory based data analysis conceives of the development of theory as a process in which deductive reasoning, observation and inductive reasoning are used to develop and extend theory. Figure 5.1 describes the theory:



**Figure 5.1 The Theory Based Data Analysis Cycle (Aneshensel, 2002)**  
**(Reproduced with permission from Sage Publications)**

In theory based data analysis, data is used (Aneshensel, 2002, p.5) to test theoretical predictions about what should be observed if a theory is valid:

This procedure is not simply one of confirming or disconfirming a set of hypotheses. Rather data analysis contributes to the development of theory. Aspects of a theory that are not supported empirically are likely to be reformulated or revised rather than merely being rejected and abandoned. Those facets that receive empirical support are likely to be refined, elaborated on, or specified with greater precision based on analytical results. Thus, analysis modifies theory as much as theory directs analysis. The use of deductive reasoning to translate theory into phenomena that are either observed or not observed in testing thus confirming or refuting. Theory based data analysis conceives of the development of theory as a process in which deductive reasoning, observation and inductive reasoning are used to develop and extend theory.

However, the research does not wholly rely on a positivist, empirical approach. Rossman and Wilson (cited by Miles and Huberman, 1994, p.41), provide good reasons for the linking of *quantitative* and *qualitative* data, namely to:

- enable confirmation or corroboration of each other via triangulation;
- elaborate and develop analysis, by providing richer detail; and
- provide fresh insight.

*Qualitative* data comprising interview notes and observations also feature in the study.<sup>27</sup> This data was gathered during pre-trial stakeholder consultation for the portal quasi-experiment, the Pilot Study discussed in *Chapter Six* and, lastly, as a result of post trial assessment. Interview and observational data gathering was aimed at:

- pre-trial assessment of owner/operator E-commerce value creation, knowledge, practice and attitudes;
- assessing the usability and acceptability of the quasi-experimental portal solution;
- assessing the effectiveness of marketing of the quasi-experimental portal solution;
- assessing the quasi-experiment's impact on E-commerce value creation, knowledge, practice and attitudes;
- exploring owner/operator perceptions on the role of strategy, collaboration and other CSFs in E-commerce; and
- exploration of knowledge information flows within the portal quasi-experimental portal group.

The study also utilizes *sociometric* data to study network behaviour in the quasi-experimental group. Section 5.7 comprises a discussion of the methods and techniques of social network analysis. Social network analysis originated in anthropology and sociology, but finds application in this study as a method for analyzing E-commerce knowledge and information flows and their association with portal adoption outcomes in the group. The discussion of

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<sup>27</sup> Data collection procedures and analysis methods are described in Section 5.6.

research methods and design concludes with a discussion of the limitations of the research, forming section 5.8.

### 5.2 Target population and sample

The research design for this research involves the administration of two survey instruments:

- A survey of *Cyber transformation* achieved in a sample of firms drawn from a population of accredited Australian Ecotourism Service Providers; and
- A survey of *E-commerce value creation* outcomes achieved by firms in the same sample.

The population for the survey component of the study consisted of 150 firms (N=150) drawn from *Ecotourism Australia's* Nature and Ecotourism Accredited Program (NEAP) product directory list of owner/operators. This list is available online at:

<http://www.Ecotourism.org.au/products.asp>

Ecotourism has been defined by the industry representative association, *Ecotourism Australia*, as:

ecologically sustainable tourism with a primary focus on experiencing natural areas that fosters environmental and cultural understanding, appreciation and conservation.

(Ecotourism Australia, 2003)

This industry was selected to supply the target population because tourism destination planning has been shown by other researchers to be based on the Web, describing a situation of *high E-readiness*. For example, in a statistical report on travelers' use of the Internet, the Travel Industry Association (TIA) (2002, p.45) reported that of 96 million travelers with Internet connections in 2002, 64 million (66%) used the Internet to make travel plans and, of online

frequent travelers, 73% used the Internet for travel planning. According to Jupiter Communications (cited Wason, 2004, p.11), 28% of all E-commerce sales in 2003 were for travel products and services.

An earlier 2000, TIA study found that (TIA, 2000, p.1):

- twenty seven per cent (27%) of online travellers in 1999 had used the Internet to make travel reservations;
- seventy seven per cent (77%) of online travellers used popular search engines for travel planning; and
- sixty three per cent (63%) used company run and destination sites for travel planning.

In Australia, Roy Morgan Research reported in 2003 that:

travel purchases have become the largest contributor to a growing Internet commerce market in Australia. The number of people who made a purchase over the Internet increased from 1.2 million in the June quarter 2000, to 2.7 million in the June quarter 2003. Significantly, one third of all Internet buyers in the June 2003 quarter purchased travel tickets or accommodation.

As a percentage of the entire Australian population, the number of people purchasing travel products over the Internet has grown considerably, from less than 1% in the June 2000 quarter, to just under 6% in the June quarter 2003. Other products have shown only marginal growth over this period, although tickets for shows and events may soon follow a similar path.

(Roy Morgan, 2003, p.1)

In summary, survey data (TIA, 2000; TIA, 2002; Roy Morgan, 2003) suggest that the Internet is a proven channel for sales and marketing in this industry. Further confirmation of this was obtained during the Pilot Study,<sup>28</sup> for this research, when one group member reported that eighty per cent (80%) of the firm's business revenues could be attributed to Internet marketing.<sup>29</sup>

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<sup>28</sup> Vide *Chapter Six, the Pilot Study*.

<sup>29</sup> Vide Section 8.3.2.



Purposeful selection of the industry/sector used for the study was adopted as a tactic for dealing with the intrusion of *product-fit* as an independent variable working to produce co-variation in the dependent variable in the focal relationship.<sup>30</sup> In a multi-industry study, where product-fit to the Web channel is not constant, but varies between products and services, the effect of such a variable would likely be to weaken any relationship that might exist between the variables of Cyber transformation and E-commerce value, even if such a relationship existed.

The sample frame therefore *excludes* industries and firms where:

- the value of Web E-commerce has yet to be tested; and
- the nature of goods or services has been found to be unsuited to the Web as a distribution channel.

At the census date of 31 July 2003, one hundred and fifty (N=150) businesses were listed in a comprehensive product search for all businesses in the database. Since survey of the entire population using *two* scales containing a total of 140 survey items would involve more than 21,000 discrete measurements, this was not deemed feasible in the light of resources available to the researcher. A sample of 108 firms (n=108), representing 72% of the population was adopted for the study. Assuming normal distribution of parameters in the population, the sample size (n=108, N=150) was determined sufficient according to Krejcie and Morgan's sample table (cited by Gay, 1996, p.125) to represent the population at the widely accepted confidence level of  $\alpha = 0.05$ . In making the decision to adopt a sample, the candidate adopted a position on sample size that was practical in terms of the work required to be done and that met the requirements of answering the Research Questions.

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<sup>30</sup> Vide Section 5.8.3 for an explanation of the role of *product-fit* as a control variable.

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All survey research involves decisions that balance the ideal of the largest possible sample frame against the availability of resources. In a study of sampling methods for health research Williams (1999, p.215) states:

in tackling the question of sample size, a researcher is balancing two competing demands. A study must be large enough to have a good chance of convincingly answering the primary research question, but not so large that study cost is greater than it needs to be.

The sample/population ratio compares favorably with the original Dutta and Segev (2001) descriptive study of Cyber transformation (n=120; N=500). This earlier study set the research agenda for the current study. At the conclusion of the survey component of the research approximately 6,000 discrete *Cyber transformation* measurements and a further 2,000 *E-commerce Adoption Survey* measurements had been made, using inspection and interview methods. To provide additional assurance in regard to the sample and sampling method used, non-respondent bias testing was adopted based on the population parameters adopted for the construction of the sample.

The sample was constructed using *stratified random sampling* methods to ensure its representative character. The population from which the sample was selected is stratified by product type: Accommodation (AC), Attraction (AT), Mixed (e.g., Accommodation and Tour) (M), and Tour (T) and by geography (operator location by region). In the construction of the sample, this stratification was preserved, subject to rounding. Subjects within categories were selected randomly using a random number table (Gay, 1996, p.253). Tables 5.1 and 5.2 describe the sample (s) and population (N) cases for the sector and region strata.

Sector Stratum	Cases (s=108)	Cases (N=150)
Tours	68	94
Accommodation	22	31
Accommodation & Tours	12	17
Attraction	6	8

**Table 5.1 Sector strata (s, N) cases**

Region Stratum	Cases (s=108)	Cases (N=150)
ACT	1	1
NSW	20	26
NT	3	4
QLD	52	74
SA	10	14
TAS	2	3
VIC	6	9
WA	14	19

**Table 5.2 Region strata (s, N)**

### 5.3 Data analysis

Quantitative data analysis and interpretation were performed in Microsoft Excel 2003 and Statistical Software Package for the Social Sciences (SPSS v 12.0 for Windows). Results from data analysis and interpretation are described in *Chapter Seven*. The selection of analysis methods (mostly non-parametric) was based on extensive data screening and assumption testing (Leedy, 1997, p.255). Bivariate and multivariate analysis was performed on the data.

#### 5.3.1 Role of independent and intervening control variables

Research questions RQ3 and RQ4 ask whether a focal relationship exists in this sample between increasing, or various kinds of, Cyber transformation and E-commerce value. At the outset of research design it was recognized that if superior E-commerce value outcomes were to be shown by the study to be related to higher level Cyber transformations, it could not be assumed that this focal relationship in the sample alone furnishes the correct causal explanation for such an outcome. Rather, some other characteristic(s) in the

sample might account for the phenomenon. These characteristics comprise *control* and *intervening* variables to the focal independent and dependent variables. The role of such variables forms an acknowledged limitation which is discussed in detail in section 5.8.3.

Known or suspected *control* variables in a study of this kind comprise:

- *product fit* to the Web channel;
- *seasonal* or *industry* factors that impact on revenue earned including E-commerce value creation;
- *value proposition* (i.e., the value of Internet commerce to the customer);<sup>31</sup> and
- so-called *E-commerce readiness* (i.e., the receptiveness of the market to E-commerce).

The research design attempts to account for the impact of such *control* variables by:

- scoping the problem in terms of *one industry/sector* with known good *product fit* and good *E-readiness*. The value of these variables is a constant in the study, meaning that their net effect on the focal relationship will be the same for all data subjects; and

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<sup>31</sup> For an extensive and well researched discussion of the role of the value proposition, *Vide* Torkzedah, G. and Dhillon, G. (2002). Measuring factors that Influence the Success of Internet Commerce. *Information Systems Research*. 13(2), 200-204.

- an approach to E-commerce value creation measurement that is robust to the distorting effects of the *value proposition* and *seasonal factors*. For example, B2C revenue earned is measured as a proportion of total revenue earned. *Ceteris paribus*, it is expected that the proportion of revenue earned as E-revenue will remain constant, while actual revenue earned may increase or decrease in accordance with seasonal industry factors and the value proposition.

The nature and affect of *intervening* variables was discussed in *Chapter Four*. It was argued that *Usability*, forms one such variable.<sup>32</sup> The research design concedes *Usability*, and data analysis and interpretation is inclusive of the net effect of Usability on the focal relationship.

To reduce the impact of control independent variables and increase the confidence with which assertions could be made about the focal relationship, a third experimental component features in the research design- *The Cape Range Ningaloo Ecovortal*. The Portal Quasi-Experiment is discussed in detail in section 5.5.

#### *5.4 Instrument Overview: Survey Instruments*

##### *5.4.1 Cyber Transformation Scale*

A *B2C Cyber Transformation Scale*<sup>33</sup> was devised to measure transformation achieved in the target population. The scale was used to apply item specific tests to Web sites owned by firms in the sample, to portals and to search engines. The logic of the sampling method and characteristics of the

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<sup>32</sup> Vide Figure 4.1, p.135.

<sup>33</sup> The *Business to Consumer (B2C) Cyber Transformation Scale* (Appendix I).

population were described in section 5.2. Operationalization of the Cyber transformation construct proceeded as a two stage process involving:

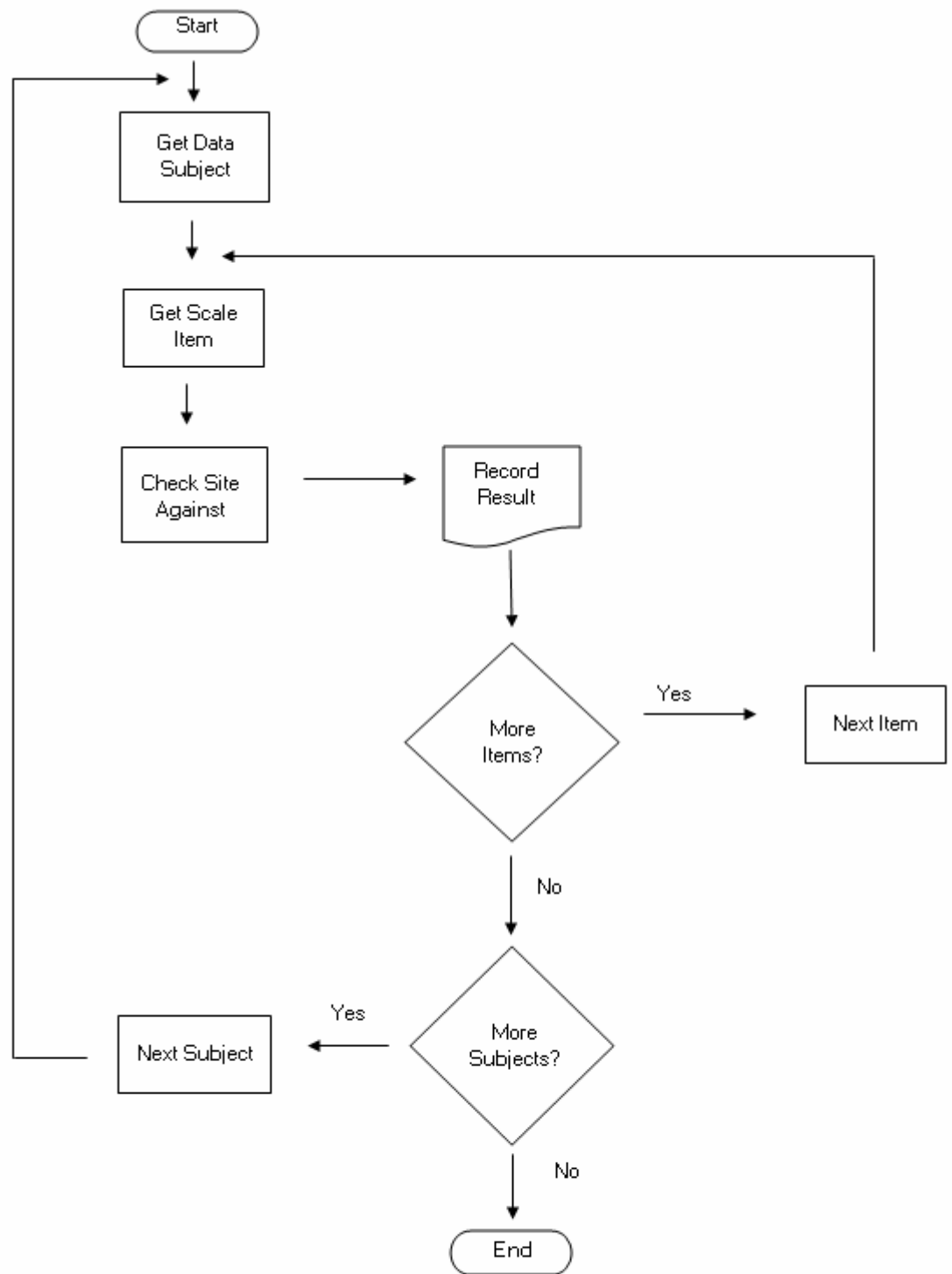
- items employed in the original Dutta and Segev (2001) scale; and
- additional items drawn from the *Chapter Three* review aimed at improving domain validity of the *Marketspace Model*.

The Cyber transformation scale was administered through inspection of B2C web sites owned by firms in the sample, and connections between these nodes and industry portals. A flow chart describing the evaluation process is reproduced as Figure 5.2. Tests were intended to establish conformity or otherwise with item criteria. Most items in the scale were treated as dichotomous variables with value 1 or 0, depending on whether the item was satisfied. Items with non-dichotomous ordinal measures, such as traffic ranks and portal counts, were captured as a PERCENTRANK<sup>34</sup> in Excel. A similar transformation, albeit logarithmic in nature, is adopted by leading search engine vendor Google in its treatment of Page Rank.<sup>35</sup> The Cyber transformation score of a firm in the sample is the sum of all item scores. This score is also captured as a PERCENTRANK, which describes the Cyber transformation standing of a firm when measured against all other responding firms.

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<sup>34</sup> Returns the rank of a value in a data set as a percentage of the data set.

<sup>35</sup> Rogers, I. (2005). *The Google Page Rank Algorithm and How it Works*. Retrieved 8 July, 2005 from <http://www.iprcom.com/papers/pagerank/>.



**Transformation Evaluation  
Flow-Chart**  
Fig.5.2

#### 5.4.2 Cyber transformation: Construct Operationalization

Cyber transformation was first operationalized by Soumitra Dutta and Arie Segev in their descriptive study undertaken in 2000. The results of this study, and a list of scale items, were published in 2001 in an account of the study entitled *Business Transformation on the Internet* (Dutta and Segev, 2001). Items appearing in the article have been adopted for the purposes of the current study, with additions. The Literature Review *Chapters Two* and *Three* describe changes in the knowledge base, and in Internet technologies, and omissions in the original theory and scale that needed to be addressed to ensure construct validity in any further research based on Dutta and Segev's (2001) transformation theory and the *Marketspace Model*. *Chapter Three*, the Literature Review: Research Design, describes the research literature that impacts on construct operationalization in more detail, and hence, considerations that affect internal validity of a scale aimed at measuring Cyber transformation. The main outcomes from these reviews were that:

- the original model did not properly account for *Usability*, which was incompletely operationalized within the range of items called *Technological Sophistication*. (*ibid*, p.8). Within the *Marketspace* model, this could be treated as falling within the customer relationships dimension or as a dimension in its own right. The *Chapter Three* literature review showed that Usability has its own knowledge domain and is most appropriately treated as a new dimension to the model; and
- the Technological Capability dimension is under-represented in terms of the Dutta and Segev scale. As the revised scale indicates, from underlying *enabling internet technologies*, through *discovery*, *interaction*, *channels* and *use of multimedia*, additional items are required to reflect the emergence of new technology



and methods. These items in some instances may be dealt with via the *Strategic Business* dimension of the existing model involving the Four Ps and customer relationships, but in some instances the items lie outside this context in the realm of “Technological Sophistication” (ibid, p.7).

Accordingly, the Cyber transformation scale employed in this research includes:

- additional items in both *Technological Capability* (TC) and *Strategic Business* (SB) dimensions, required to update the original theory to account for changes to the technology and business strategy environments since 2001; and
- a new *Usability* dimension.

The following discussion describes instrument design and procedures for the two survey instruments employed in the design, the *Cyber transformation Scale* and *E-commerce Adoption Survey*. Footnotes are used to provide ready reference to sections of the Literature Review that relate to construct operationalization and provide justification for inclusion of the item in the scale in terms of face validity.

#### 5.4.3 Instrument Design: Operationalizing Usability

The transformation scale used in this study operationalizes usability around nine scale items that function as measures for implementation of Nielsen’s (1994b) heuristic principles plus measures from the Palmer (2002) five factor model. Ordered by scale item number, the nine usability items used (with footnote references to sections of the *Literature Review* that concern domain validity) were:

9.1 User mental map.<sup>36</sup>

9.2 Download optimization.<sup>37</sup>

9.3 Logical Information architecture.<sup>38</sup>

9.4 Consistent interface.<sup>39</sup>

9.5 Efficient navigation.<sup>40</sup>

9.6 User control.<sup>41</sup>

9.7 Site operational functionality.<sup>42</sup>

9.8 Standard use of technology.<sup>43</sup>

9.9 Efficient e-commerce transactions.<sup>44</sup>

The measures adopted from Nielsen (1994b, 2000, 2002) and Palmer (2002) are also found elsewhere in the performance evaluation literature on usability e.g.

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<sup>36</sup> Vide Section 3.2, p.97.

<sup>37</sup> *Ibid.*

<sup>38</sup> Vide Section 3.2, p.99.

<sup>39</sup> Vide Section 3.2, p.101.

<sup>40</sup> Vide Section, 3.2, p.96.

<sup>41</sup> Vide Section, 3.2, p.101.

<sup>42</sup> Vide Section, 3.2, p.102.

<sup>43</sup> Vide Section, 3.2, p.100.

<sup>44</sup> Vide Section, 3.2, p.102.

McKenzie (2000), Corry *et al.* (1997), Gullikson *et al.* (1999), Shneiderman, (1998) and Rosenfeld (1997). Because sites in the sample were small, involving shallow rather than deep hierarchies of organization, the last of Nielsen's heuristics –“Help and documentation” was omitted from the scale. Both McKenzie (2000) and Nielsen (2002) accept this practice where site density or sophistication makes this feature redundant.

#### 5.4.4 Usability coding, measurement and procedure

All items in the Usability section of the scale were treated as dichotomous variables with values of 1 or 0 depending on whether an E-commerce Web site passed or failed the test. All assessments of Web sites in the sample were performed according to the *inspection* method rather than the alternative method of *usability testing* by user groups.

Nielsen (2003, p.1) describes inspection as:

the generic name for a set of methods that are all based on having evaluators inspect a user interface. Typically, usability inspection is aimed at finding usability problems in the design, though some methods also address issues like the severity of the usability problems and the overall usability of an entire system.

Inspection can be based on a variety of usability testing techniques including *heuristic evaluation*. In this technique, expert judgments are made as to whether “each dialogue element follows established usability principles (the ‘heuristics’).” (*ibid*)

The selection of *inspection* based on *heuristic evaluation* forms an acknowledged limitation of the design, where a more reliable measure might have been obtained by user testing. However, over a large sample of sites, such a method was not feasible.

#### 5.4.5 Instrument Design: Operationalizing Technological Capability

*Chapter Two* provides an account of the literature on CSFs in E-commerce adoption, inclusive of factors germane to the work of Dutta and Segev (2001) on Cyber transformation theory, plus many others suggested by other research and changes in technology capability since 2001. These factors include technologies that simulate human experience,<sup>45</sup> provide for immersive rich interaction<sup>46</sup> and enable mobile wireless location based interaction with information systems.<sup>47</sup> The Review also described research on technology tactics and methods that impinge upon E-commerce adoption outcomes including discovery and Search Engine Optimization (SEO).<sup>48</sup> *Chapter Two* contextualized the operation of these factors in terms of the target population, namely, SMTEs.

In *Chapter Three*, the literature on Technological Capability construct operationalization was investigated. The literature was grounded in RBV thinking about the role of technology in securing competitive advantage (Affuah and Tucci, 2001; Straub and Klein, 2001; Lucas, 2002). Within the *Technological Capability* dimension, clusters were identified describing Internet Point of Presence (PoP), Architecture, Enabling Internet Technologies, Discovery, Interaction/Simulation, Channels and Multimedia. Consequently, the following items were identified for inclusion in the *Technological Capability* component of the scale. Footnotes are used to provide ease of reference for relevant sections of the review used to establish item validity:

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<sup>45</sup> Vide Section 2.3.4.1, p.66.

<sup>46</sup> *Ibid.*

<sup>47</sup> Vide Section, 2.3.4.5 p.73.

<sup>48</sup> Vide Section, 2.3.4.3 p.71.

- Internet Point-of-Presence (PoP) (Type, Domain registration and Industry portal count) (Items 1.1-1.3);<sup>49</sup>
- Architecture (Client/Server, Peer-to-Peer) (Items 2.1-2.3);<sup>50</sup>
- Enabling Internet Technologies (Static or Dynamic HTML, XML, Web enabled DBMS)(Items 3.1.1-3.1.4);<sup>51</sup>
- Discovery (Metadata, Google links and Page Rank, AlltheWeb links and Alexa Traffic rank (Items 3.2.1-3.2.5);<sup>52</sup>
- Interaction/Simulation (Flash/QT(VR), Forms) (Items 4.1-4.2);<sup>53</sup>
- Channels (Mobile, VOIP) (Items 5.1-5.4);<sup>54</sup> and
- Multimedia (Video, Streaming media, Animation/Sound) (Items 6.1-6.3).<sup>55</sup>

Discovery is an important transformation criterion. Factors that critically determine discovery include:

- whether a site can secure an advantageous page ranking from search engines;

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<sup>49</sup> Vide Section 3.3.1, p.104.

<sup>50</sup> Vide Section 3.3.3, p.107.

<sup>51</sup> *Ibid.*

<sup>52</sup> Vide Section 3.3.4-3.3.5, pp.110-111.

<sup>53</sup> Vide Section 2.3.4.1, p.66.

<sup>54</sup> Vide Section 3.3.6, p.113.

<sup>55</sup> Vide Section 2.3.4.1, p.66.

- connections made to referrer sites; and
- connections made with industry portals and other places of aggregation.

A site that is well connected will have more unique visitors, page hits and opportunities to do business. The following measures are used in this study to measure discovery related transformation:

- inclusion in industry portals (*Items 1.1&1.3*);<sup>56</sup>
- own web site (*Item 1.2*);<sup>57</sup>
- use of metadata (*Item 3.2.1*);<sup>58</sup>
- unique links to this site from other sites as measured by a Google link site URL search (*Item 3.2.2*);<sup>59</sup>
- Google's PageRank (*Item 3.2.3*);<sup>60</sup>
- site traffic as measured by AlltheWeb's traffic rank (*Item 3.2.4*);<sup>61</sup>  
and

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<sup>56</sup> Vide Section 3.3.1, p.105.

<sup>57</sup> Vide Section 3.3.1, p.104.

<sup>58</sup> Vide Section 3.3.4, p.110.

<sup>59</sup> Vide Section 3.3.5, p.111.

<sup>60</sup> *Ibid.*

<sup>61</sup> Vide Section 3.3.5, p.112.

- site traffic as measured by Alexa's Traffic Rank (*Item 3.2.5*).<sup>62</sup>

The owner of a B2C node can maximize the opportunity for discovery by securing portal and directory listings that provide product descriptions and links back to the owner's Web site. Portal/directory selection involves decisions about fees and charges, available services and portal/directory market share in terms of key metrics such as unique visits, loyalty and recency. Integration of portals with other channels such as print media and television, creates a highly effective convergent environment for sales and marketing (Wason, 2004; Jung *et al.* 2002).

In the Australian tourism online marketplace, Government owned portals operate at the national and regional levels, providing portal services to tourism businesses on a fee paying basis. For example, the Australian Tourist Commission operates a national portal/gateway service known as *Australia.com*, which supplies event, destination planning, activity and service provider based information services aimed at consumers in nine languages.<sup>63</sup> The WA Tourism Commission operates a portal on behalf of the Western Australian Government<sup>64</sup> and taking the Gascoyne Region as a case study, this activity is augmented at a local level by portals and gateway services operated by the Gascoyne Development Commission<sup>65</sup> and Outback Coast Tourism

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<sup>62</sup> *Ibid.*

<sup>63</sup> Australian Tourist Commission. (2003). *Australia.com*. Retrieved 22 April, 2003 from [http://syd.australia.com/home\\_UK.aust?L=en&C=GB](http://syd.australia.com/home_UK.aust?L=en&C=GB).

<sup>64</sup> Western Australian Tourism Commission (2003). *Discover Western Australia*. Retrieved 22 April, 2003 from <http://www.westernaustralia.net/discover/index.shtml>.

<sup>65</sup> Gascoyne Development Commission (2003). *Gascoyne Development Commission*. Retrieved 22 April, 2003 from <http://www.gdc.wa.gov.au/default.asp?documentid=1>.

Ltd.<sup>66</sup> Private sector industry portals operate on a variety of business models including payback, where partnering businesses pay a percentage of the value of each transaction back to the portal operator.

Tourism portals can be content rich and incorporate multimedia and database driven services including online booking. Directory type services are, in comparison, modest. A directory is a list of links organized by topic. Directories aggregate links that relate to a theme, product or service. Internationally, Yahoo is a major provider of directory services to the tourism industry.

#### *5.4.6 Technological Capability coding, measurement and procedure*

Most items on the scale were treated as dichotomous variables with dummy values of 1 and 0. For example, Metadata (Item 3.2.1) has dummy values 1 and 0, representing the presence or absence of metadata. An acknowledged limitation concerns the granularity of this approach. In particular, the information retrieval efficiency of meta-tagging was not tested, due to the impracticality of this kind of testing over a sample of this size. Thus, the research design does not attempt to determine the optimality of keywords used either in metadata or in the body of pages.

A small number of scale independent variables exist such as the L2S (Google links to this site) (3.2.2), Google Page Rank (3.2.3), AlltheWeb (3.2.4) and Alexa Traffic rank (3.2.5). The Google L2S score measures the extent to which Google ranked sites are connected to other sites, thus providing a nominal index for Google of connection to the Internet. To ensure measurement reliability, the Google links measure was captured as a mean over three

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<sup>66</sup> Outback Coast Tourism Ltd (2001). *Western Australia's Outback Coast: Where the reef meets the outback*. Retrieved 22 April, 2003 from <http://www.outbackcoast.com/>.



consecutive months. The Google L2S score was calculated by converting the integer links score to a percent rank in Excel, i.e., the rank of this value within the data set expressed as a percentage of the data set. The maximum value was 1.000 (100.000%), denoting the Internet PoP with the maximum number of Google links.

For any given page, another Google metric, the Google PageRank is extractable using the Advanced Google Toolbar. As discussed in section 3.3.5, PageRank provides a relative measure not just of connection, but of the quality of connected pages. The maximum PageRank is 10/10. Google translates the raw Page Rank into a scale measure in the range 0.0 to 1.0 (a similar transformation to that employed in this research to measure link popularity and traffic rank). To ensure measurement reliability, site PageRank was captured as the mean rank recorded over three consecutive months.

To provide a nominal index of connection for sites ranked by Yahoo/Overture powered search engines, rather than Google, AlltheWeb links were measured. The logic of this action is explained in section 3.3.5. Once more, the procedure involved a mean measure taken over three months of inspection. Mean values were transformed into a percent rank score in Excel, i.e., the rank of this value within the data set expressed as a percentage of the data set.

Operationalizing and measuring portal inclusion involved the processes of identifying industry portals and checking for inclusion. *AddMe.com*'s<sup>67</sup> link popularity service was used to identify pages that linked to Internet PoPs in the sample. Inspection was used to categorize pages as portal/directory or otherwise. Multiple pages sharing a common domain were counted once

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<sup>67</sup> Addme.com (2003). *Link Popularity*. Retrieved 22 June, 2004 from <http://www.addme.com/popularity.htm>.

only. A portal/directory score was calculated with Excel's PERCENTRANK function by converting the integer portal/directory score to a percent rank, i.e., the rank of this value within the data set expressed as a percentage of the data set. The maximum value was 1.000 (100.000%), denoting the Internet PoP with the maximum number of portal/directory links.

Multimedia, interactive multimedia, and multimedia computing, all share a common property: the integration of different media such as text, graphics, sound, video and animation within a computer based application to enhance communication and interaction potential. Contextualized in terms of Ecotourism, rich immersive interaction and simulation can be used to provide walkthroughs of natural environments and user-controlled exploration of such environments intended to communicate values connected with, or understanding of, a place and its ecosystem.<sup>68</sup> Multimedia, such as video or audio lacks the immersive character of interactive multimedia but can be used to communicate the sense of a place and an understanding of its values. The purpose of both in an Ecotourism web site is to promote a destination or experience in ways that influence consumer behaviour.

Interaction and simulation was operationalized in terms of the following factors:

- HTML forms-typically used to gather client data for processing via a common gateway interface (CGI). For example, a HTML form might be used to process a reservation enquiry or assist with destination planning;<sup>69</sup>

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<sup>68</sup> Vide Section 2.3.4.1, p.66.

<sup>69</sup> Vide Section 3.3.3, p.108.

- Flash interactive movies-to deliver rich, immersive interactive multimedia or simulation promoting a destination;<sup>70</sup> and
- Quicktime Virtual Reality (QT/VR) delivered primarily as simulation. For example, a walk through a building or forest.<sup>71</sup>

Interaction and simulation was treated as a dichotomous variable with value of 1 or 0 corresponding to the presence or absence of Flash or Quicktime. HTML forms were treated in the same manner.

Downloadable video, streaming media and animation/sound were also treated as dichotomous variables in the study with values 1 or 0 depending on whether they were found on a site, or otherwise.

Utilization of wireless and hybrid channels was treated as a dichotomous variable with values of 1 or 0 depending on whether a firm utilized any of the technologies described for doing business online. The scope for application included product distribution, customer relations and destination marketing.<sup>72</sup>

#### *5.4.7 Instrument Design: Operationalizing Business Transformation*

In the Literature Review *Chapters Two and Three*, the literature on business transformation and in E-commerce adoption was investigated. This discussion showed clear evolution in the thinking about strategic business transformation from a focus on the firm (E-commerce) to one of firm collaboration (C-commerce). The review also canvassed a Resource Based View (RBV) of the role of technology and how it might be used to secure competitive advantage, such as through the leveraging of so-called

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<sup>70</sup> Vide Section 2.3.4.1, p.66.

<sup>71</sup> *Ibid.*

<sup>72</sup> Vide Section 3.3.6, p.113.

'complementary assets.'<sup>73</sup> In *Chapter Three*, the focus switched to literature that relates directly to construct operationalization and hence, to the design of a scale instrument. Research on Internet marketing and online customer satisfaction was explored to provide an account of factors that needed to be considered in the design of scales and quasi-experimental components.<sup>74</sup> Additional items, plus items inherited from the 4P scale constructed by Dutta and Segev, form the basis of the revised scale.

Not all quadrants of the *Marketspace Model* displayed issues in terms of domain validity. For example, Dutta and Segev's discussion of *Price transformation* remains highly pertinent and their operationalization of pricing was adopted for this study, with one minor modification- the discarding of *charging of customers for proportions of products consumed* (Dutta and Segev, 2001, p.8). This change was required to account for the industry/sector specific nature of this study, which is concerned with *services* offered in tourism, as opposed to the multi-industry/sector character of the original Dutta and Segev's (2001) study, which included both *goods* and *services*. The decision to exclude pricing for proportional consumption was validated with reference to the Pilot Study group. Price availability, price dynamic customization and the availability of online price negotiation were translated as items 7.11.1-7.11.3 respectively.

In the original scale, items were clustered in terms of the five sub-dimensions of *Products, Price, Promotion, Place and Customer Relations*. This organization has been retained. Footnotes are used to provide ease of reference for relevant sections of the review used to establish item validity:

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<sup>73</sup> Vide Section 2.4.1, p.82.

<sup>74</sup> Vide Section 3.4.1, p. 117 and 3.4.4, p.120.

- Transformation of Products: Directories, customization and user input to specification and design (Item 7.1-Item 7.3);<sup>75</sup>
- Transformation of Promotion: Advertising, customization and alliances (Items 7.4-7.10);<sup>76</sup>
- Transformation of Prices: (Item 7.11);<sup>77</sup>
- Transformation of Place: Online ordering and fulfillment (Items 7.12-7.13);<sup>78</sup> and
- Customer relations transformation: Personalization, Community and Trust (Items 8.4-8.7).<sup>79</sup>

#### 5.4.8 Business transformation coding, measurement and procedure

In common with the *Usability* and *Technological Capability* dimensions, most items in *Business Transformation* lend themselves to treatment as dichotomous variables.

Whether fulfillment took place with the security of SSL encryption, whether a site certificate was available to provide assurance of authenticity, were conditions required to be satisfied to meet the requirements for trusted E-commerce transactions. Site publication of a privacy policy describing retention and access to personal data gathered passively or actively as a

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<sup>75</sup> Vide Section 3.4.2, pp.118-120.

<sup>76</sup> Vide Section 3.4.1, p.117.

<sup>77</sup> Vide Section 3.4.4, p.120.

<sup>78</sup> Vide Section, 3.4.3 p.119.

<sup>79</sup> Vide Section 3.4.4, p.120.

consequence of consumer interaction satisfied the privacy policy test.<sup>80</sup> Facets of the personalization construct selected for operationalization comprised languages and bandwidth customization.<sup>81</sup> Community was operationalized in the Cyber transformation instrument on the basis of forums and guestbooks.<sup>82</sup>

#### *5.4.9 Instrument Design: E-commerce Adoption Survey*

Design of the E-commerce Adoption Survey instrument was determined by the research problems and related hypotheses set for the study, conclusions from the Literature Review on E-commerce value creation,<sup>83</sup> the role of strategy<sup>84</sup>, E-metrics<sup>85</sup> and E-intelligence.<sup>86</sup>

The work of Barua *et al.* (2001b), Zhuang and Lederer (2003), Zhu and Kraemer, (2002) and Alexander, (2000) was assessed as instructive and important in the consideration of instrument design. Importantly, Barua *et al.* (2001b) claim to have validated eight E-measures of value creation by observing strong correlation between these measures and financial performance measured against the four classic metrics of revenue earned, gross margins, return on assets and return on investment.

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<sup>80</sup> Vide Section 3.4.4, p.120.

<sup>81</sup> *Ibid.*

<sup>82</sup> *Ibid.*

<sup>83</sup> Vide Section 2.4, p.82.

<sup>84</sup> Vide Section 2.1.6, p.36.

<sup>85</sup> Vide Section 2.3.4.8, p.78 & 2.4.2, p.83.

<sup>86</sup> Vide Section 2.3.4.8, p.78.

Thus, in the areas of E-commerce value creation measurement and independent control variables, the design draws substantially upon the work of Anitesh Barua, Prabhudev Konana and Andrew Whinston's (2001) *Measures for E-business Value Assessment*, with additions that relate to the goals of this research (i.e., cyber transformation evaluation) and the need to address omissions (such as, the area of investment horizons).

Logical groupings of items used in the *E-commerce Adoption Survey* concern:

- the profiling of surveyed businesses in terms of independent variables such as size, turnover, market capitalization, *et cetera*;
- modes of operation (Retail, Consumer direct *et cetera*);
- E-commerce value creation metrics;
- the impact of online in terms of operational excellence;
- E-commerce investment in the form of establishment budgets;
- E-strategy; and
- E-intelligence.

The discussion that follows in this section presents instrument items in terms of these groupings. The complete list of items appears as Appendix II.

#### *5.4.9.1 Firm profile metrics (Items 1.1-1.4)*

In their study, Barua *et al.* (2001, p.37) had found that as firm size increased the relationships between E-commerce drivers and financial performance, and operational excellence and financial performance, grew stronger. By inference, it would be expected that the relationship between *Cyber transformation* and financial performance would similarly grow stronger with firm size. The current study operationalizes firm size in terms of the standard measures of employees, turnover, market capitalization and net assets. The

classificatory scheme adopted utilizes Australian Bureau of Statistics nomenclature and definitions for SMEs (ABS, 2002a).

#### 5.4.9.2 Modes of operation (Items 3.1.1-3.1.3; 3.2.1-3.2.2)

In this population, businesses operate in one of three basic modes:

1. retail sales only (B2B with no B2C operations);
2. consumer direct sales only (B2C with no B2B sales via wholesalers or agents); and
3. mixed mode (a combination of B2B and B2C sales).

Modes of operation are related to the kinds of E-commerce planning, resources and the transformation achieved by firms online. During the Pilot Study discussed in *Chapter Six*, it was observed that firms typically operate in mode three, and that isolation of the B2C component of E-value would be required to test a B2C E-commerce adoption theory, namely Cyber transformation theory. Thus, the instrument includes items aimed at determining the respective contributions of B2C and B2B to the E-value stream.

#### 5.4.9.3 E-commerce value creation metrics (Items 4.1-4.7, 7.1, 11.1)

Metrics selected for E-commerce value creation measurement in this study are derived from the work of Barua, Konana, Whinston and Yin (2001) and Golden, Hughes and Gallagher (2003). No new metrics were created. Items adopted are inclusive of purely *financial measures* (e.g., percentage of revenue generated online) and *E-measures* (e.g., online sales leads). The *financial measures* were:

- percentage of *total revenue* generated by online B2C and B2B activity (Barua *et al.* 2001, p.37);
- revenue per employee generated online (*ibid.*, p.37); and



- return on investment in E-commerce- calculated both as a percentage and in terms of time horizon for payback (Barua *et al.* 2001, p.37)

Barua *et al.* (2001) specify a number of *E-measures* observed to have good correlation with traditional *financial measures*. These measures were also adopted:

- percentage of new customers acquired online (*ibid.*, p.37); and
- percentage of existing customers doing business online (Barua *et al.* 2001.p.37).

Additionally, Golden, Hughes and Gallagher (2003) suggest the importance of sales leads (requests for information) received online.

A further indirect measure of the importance of E-commerce was obtained through the use of a scale that invited respondents to rate their satisfaction with E-commerce revenue returns. The scale utilized *ordinal* category measures with attached values corresponding to more or less of the property being measured (Extremely dissatisfied=1; Dissatisfied=2; Neutral=3; Satisfied=4; Extremely satisfied=5).

#### 5.4.9.4 Impact of online: Competitive Advantage (Items 5.1.1-5.1.8)

During the Pilot Study, it was recognized that the accuracy of owner/operator estimates of revenue earned online and sales leads generated online were potentially unreliable, due to differences in the significance of E-commerce as an income stream and overall business operational excellence. The design accounts for this source of potential unreliability through the use of a scale in which owner/operators were requested to *rate the impact of E-commerce on competitive advantage* in terms of:

- cost reduction (Item 5.1.1);
- new customers (Item 5.1.2);
- customer relationship enhancement (Item 5.1.3);
- operational efficiency (Item 5.1.4);
- beneficial alliances and collaborations with other firms (Item 5.1.5);
- entry into new markets (Item 5.1.6);
- increased revenue earned per employee (Item 5.1.7); and
- improved return on assets (Item 5.1.8).

The scale utilized *ordinal* category measures (None, Low, Moderate, High and Very High) corresponding to more or less of the property being measured.

#### 5.4.9.5 E-commerce investment and early adopter advantage (Items 6.1-6.2, Item 7.1)

Firm investment in E-commerce was measured in terms of *Establishment budgets*<sup>87</sup> and *budgets* for the surveyed financial year. Responses were expected to show a relationship with return on investment measured as a percentage and in terms of the time horizon to achieve payback. Firms spending more on E-commerce were expected, *a priori*, to take longer to generate payback.

Whether or not early adopters of Web E-commerce enjoyed superior E-commerce value creation outcomes was also targeted for investigation. Participating firms were asked to estimate the number of years they had been

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<sup>87</sup> Inclusive of the factors of consultancy, web site design and implementation and site hosting.

involved with E-commerce, providing the basis for comparison in terms of cyber transformation outcomes and E-commerce value creation outcomes.

#### 5.4.9.6 E-strategy and E-Intelligence (Items 8.1-10.27)

The remainder of the *E-commerce Adoption Survey* contains items that relate to the constructs of *E-strategy*<sup>88</sup> and *E-intelligence*<sup>89</sup> and their role in E-commerce adoption. Items 8.1 and 8.2 are dichotomous and measure whether a responding firm has a formal (written) strategy for doing business online and whether this strategy has been integrated with broader business strategy. An online business plan was taken to satisfy the requirements for a formal (written) strategy. Items 9.1-9.10 are dichotomous and concern the promotions dimension of the E-strategy construct, operationalized around the clusters of advertising, online promotion, online promotion alliances, branding, accreditation and Internet direct marketing.<sup>90</sup> Finally, utilization of Web metrics for E-strategy decision making was tested.<sup>91</sup> *E-metrics* available to firms include performance metrics (e.g., site hits, traffic, usability) and marketing metrics (e.g., unique visitors, return visitors, visitor identities, recency, referrer sites and clickthrough rates). Alexander (2000, p.2) argued that E-metrics that connect directly with traditional measures of business value should be preferred. Consequently, it was decided to adopt the Gartner group family of E-metrics based on reach, acquisition, conversion, retention, loyalty, duration, abandonment, attrition, churn and recency (*ibid.*).

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<sup>88</sup> Vide Section 2.1.6, p.36.

<sup>89</sup> Vide Section 2.5.3, p.90.

<sup>90</sup> Vide Section 3.4.1, p.117.

<sup>91</sup> Vide Section 2.4.3, p.85.

#### 5.4.10 E-commerce Adoption Survey: Procedure for Administration

Data gathering for the *E-commerce Adoption Survey* proceeded on the basis of an initial telephone interview based on a subset of questions contained in the complete instrument, followed by a hard copy mail-out describing initial responses and an invitation to complete the full instrument online. According to De Vaus (2002, p.123), administration of questionnaires by telephone displays the following advantages:

- it enables skilled interviewers to build rapport with respondents;
- it involves cost savings compared with face-to-face interviews;  
and
- response rates are superior to postal self-administration.

In a study that compared response rates in forty five studies involving the methods of face-to-face interview, telephone and postal administration, De Leeuw and Collins (1997) found that face-to-face interview, followed by telephone surveys and postal surveys achieved the highest response rates. Contextualized in terms of a like population, Gratzer and Winiwater's (2004) study of personalization in the Austrian tourist accommodation industry, which returned a 4% response rate ( $n=7500$ ;  $r=297$ ), suggested reservations about the likely efficiency of postal administration when applied to this industry. Logistical factors also suggested the appropriateness of telephone administration. With a sample constructed from a population of Ecotourism providers located in wilderness regions far removed from the researcher, face-to-face interviewing was not a feasible option.

## 5.5 Portal Quasi-Experiment

### 5.5.1 Cape Range Ningaloo (CRN) Portal Quasi-Experiment: Design and methods

The Literature Review, *Chapter Two*, describes Timmers' (1998) taxonomy<sup>92</sup> of business models, including higher order Cyber transformation models based on the concepts of *virtual community* and *collaborative platforms*. *Chapters Two* and *Three* also introduced the research literature on SME and SMTE C-commerce in the business strategy domain<sup>93</sup> and the emergence of M-commerce as a trajectory in SMTE technological capability.<sup>94</sup>

These factors describe parameters for the construction of a high order Cyber transformation business solution, forming a *proof of concept* experimental test bed for Cyber transformation ideas. In this study, such a proof of concept experimental system was provided by the Cape Range Ningaloo (CRN) vertical market portal, a regional ecological and tourism portal implemented outside the control conditions of a laboratory with a group of industry partners. Thus, a 'quasi-experiment' (Cook & Campbell 1979, O'Hara 1999) was conceived that would provide a third triangulatory component to the research design. A quasi-experiment (Cook & Campbell 1979, O'Hara 1999) is an experiment conducted under field conditions outside the context of laboratory controls and where the practice and real usage of a system are the primary subjects for investigation. The experiment would be used to determine if a high order Cyber transformation business solution incorporating C-commerce and M-commerce functionality could be applied to

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<sup>92</sup> Vide Section 2.3.4.6, p.75.

<sup>93</sup> Vide Section 2.1.7, p.39 and Section 2.3.4.7, p.77.

<sup>94</sup> Vide Section 2.3.4.5, p.73.

an Ecotourism industry group to produce E-commerce value creation benefits.

Design logic for the quasi-experiment encompassed three basic justifications for triangulation as described by Sarantakos (1998, p.169): namely,

- to achieve a higher degree of validity and reliability;
- to overcome possible deficiencies arising from other methods employed (for example, a low response rate recorded with the *E-commerce Adoption Survey*)<sup>95</sup>; and
- to provide additional information on the same issue (specifically, through the analysis of log files created on the portal server, and interviews with the owners of participating firms).

The experiment would involve the classic processes (Sarantakos, 1998, p.171) of:

- establishing the experimental conditions (identification and enlistment of industry partners, user requirements analysis, concept feasibility investigation, systems specification and creation of the system);
- measuring the dependent variable (E-commerce value);
- introducing the independent variable (the shared infrastructure M-Commerce portal solution);
- re-testing the dependent variable (E-commerce value); and

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<sup>95</sup> Vide Appendix II

- assessing the presence and extent of change in the dependent variable.

#### 5.5.2 Portal Experiment- Procedure

Administration of the portal quasi-experiment involved the following steps:

- identification of a quasi-experimental group (with characteristics similar to those found in the survey sample) to which the Cyber transformation remedy could be applied;
- the taking of baseline measurements describing E-commerce value before the remedy was applied;
- construction and application of the remedy; and
- re-measurement of E-commerce value to determine what change in the dependent variable (if any) had taken place.

The portal was constructed during 2001-2003.<sup>96</sup> Industry recruitment for the portal quasi-experiment did not achieve thresholds necessary for the application of empirical data analysis and the analysis subsequently relied upon qualitative data in the form of interviews and analysis of the social network operating in the group. Data gathering procedures and analysis methods are discussed in sections 5.6 and 5.7.

#### 5.5.3 Portal Experiment- Core functionality

The provision of shared portal infrastructure of the kind provided by CRN, describes the introduction of infrastructure for collaborative competition based on what Timmers (1998, p.7) describes as an E-mall business model.

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<sup>96</sup> Brogan, M. and Kohli, G. (2003). Case Study in the Construction of a Vertical Market Portal: The Cape Range Ningaloo Project. *Proceedings of the Virtual Communities Conference, London 16-17 June, 2003*. Infonortics (Eds). Retrieved 14 July, 2003 from <http://www.infonortics.com/vc/vc03/slides/brogan-txt.pdf>.

More accurately, in terms of Timmers eleven basic business models for the E-marketplace, CRN should be considered a hybrid, containing elements of both the E-mall and Virtual Community models.

Portals are online gateways to information that provide an integrated interface and organizational structure to Web deliverable content. The portal constructed was based on the 'vertical market portal' or 'vortal' approach to portal construction. According to Panopoulos and Palmer (2001, p.1):

A vortal (or vertical industry portal) is a Web site that brings together timely information about products, services, and E-business solutions in one virtual marketplace for groups with similar interests or needs in a particular industry. These sites specialize in aggregating news, research, processing transactions, and application services suited to an end user's specific interests. Unlike "one-stop shops," like Yahoo!, "vortals," focus on a specific industry or niche.

CRN was conceived as a thematic vertical market portal aggregating news, research, and services around a geographic and ecological theme. Content on the portal is provided by members who register as project owners and upload web and non-web native documents to portal project libraries. The following communities are currently served by the portal:

- academic researchers;
- Ecotourism operators; and
- activist communities.

The core functional requirements for the portal, with in-text references to the CSF and RBV research literature establishing requirement validity in the SMTE E-commerce domain, were:

- *virtual community* using forums (Dellaert, 1999; Antonioli and Baggio, 2002a, 2002b; Corigliano and Baggio 2003);
- access to a directory service that provided consumers with product information about Ecotourism operators active in the



region (Ody, 2000; Amor, 2002; Treese and Stewart, 2003; De Waal, 2004);

- a *customisable* visit planner that mapped ecological events such as whale shark migrations, coral spawning and turtle nesting to calendar months (Amor, 2002);
- a real time news service available to each participating Ecotourism operator enabling the broadcast or narrowcast of static or dynamic information concerning special offers, discounts and other promotions (Eriksson, 2002; Kanerva, 2004);
- support for multimedia formats including movies (Rayman-Bacchus and Molina, 2001; Gretzel and Fesenmaier, 2003; Buhalis 2003); and
- an M-commerce capability that enabled cellular narrowcasting (via an SMS gateway) of promotions, news and offers to a subscriber base (Eriksson, 2002; Schmidt-Benz *et al.* 2002; Schmidt-Benz *et al.* 2003; Kanerva, 2004).

The advantages for Ecotourism operators that accrued in principle to participation in the vertical market portal included:

- connection to a regional portal hub with links back to the operator PoP;
- positive externalities generated from a rich resource of interpretive information on ecology and biodiversity in the region;
- access to mobile data integration via an SMS Gateway;

- assistance from the project team to create a multimedia enhanced project presence on the portal; and
- access to a monthly E-business newsletter providing E-strategy suggestions (based on Cyber transformation theory) for improving the performance of Internet enabled business systems.

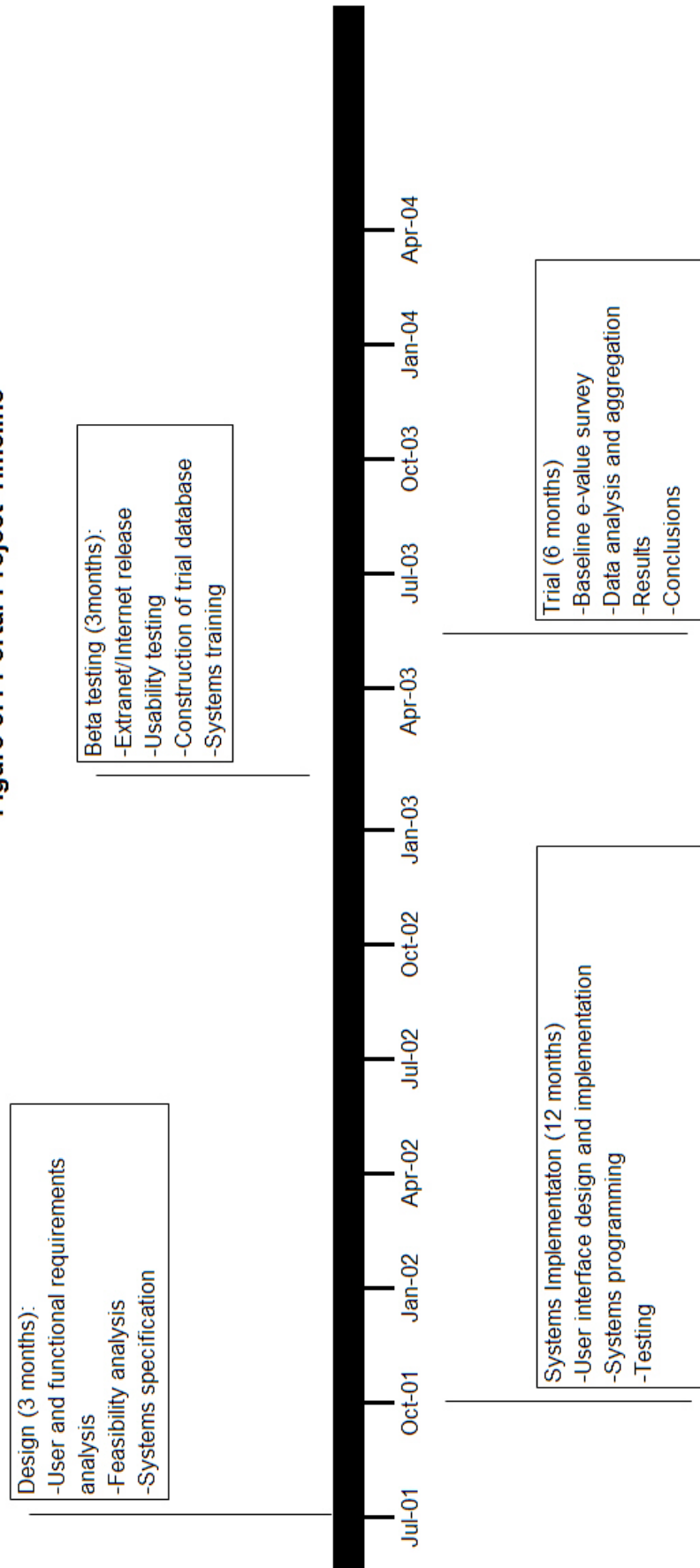
Figure 5.3 consists of a screen dump describing the portal home page interface:



**Figure 5.3 The Cape Range Ningaloo Portal Home Page (Brogan, 2004)**

The project commenced in July, 2001. An extranet enabled version of the site went live in December 2002. Beta testing of the live site commenced in February 2003. Pre-trial baseline measurement of pre-portal E-commerce value outcomes commenced in April 2003, concurrent with adoption of the portal as a home page at the Exmouth Visitor Centre. A mobile data integration capability based on SMS was extended to the portal in June 2003.

The timeline of construction and measurement activity for the portal is shown in Figure 5.4.

**Figure 5.4 Portal Project Timeline**

### 5.6 Qualitative data: Interviews and observations

In their *Handbook of Qualitative Data Research*, Denzin and Lincoln (2000, p.10) provide what Silverman (2004, p342) describes as a consensual position on the merits of qualitative research based on interviews and observations:

Both qualitative and quantitative researchers are concerned with the individual's point of view. However, qualitative investigators think that they can get closer to the actor's perspective through detailed interviewing and observation. They argue that quantitative researchers are seldom able to capture their subjects' perspectives because they have to rely on more remote, inferential empirical methods and materials.

Field work in this study provides essential insights into actor perspectives that could not be discovered purely by empirical work. Fieldwork data sources consist of interviews and observational data.

Both quantitative and qualitative methods can be applied to the analysis of interview data. Lee and Fielding (2004) further distinguish lexical, code-based, analytic and case-based analysis methods. Content analysis is a popular lexical method in which recurring words and phrases are assigned codes. Coded instances can be repeated in the texts of subjects, providing the basis for statistical inference. Franzosi (2004) frames content analysis as an essentially quantitative technique. However, Wilkinson (2004) argues that while content analysis is classically portrayed as a quantitative technique, it can also be applied qualitatively. In qualitative content analysis, inspection of the text proceeds on the basis of detection of instances (such as 'items', 'themes' or 'discourses'), which are presented with quotations from the text.

The small size of the portal experiment group, suggested the *inappropriateness* of a lexical quantitative approach, based on quantitative content analysis. Rather, it was decided to proceed on the basis of qualitative thematic analysis (Wilkinson, 2004) grounded in the dominant themes presented by the texts and the cases they represent. Thus, analysis of interviews proceeds from *interpretivist* assumptions about the derivation of meaning, rather than *positivist* assumptions in which theory is used to prove or disprove

categorically. This interpretation of the role of qualitative research is entirely appropriate where the aim is to provide essential insights into actor perspectives. However, validity is a serious problem with all qualitative analysis (Perakytá, 2004; Lee and Fielding, 2004; Silverman, 2004). Hence, to provide greater assurance in analysis, findings from qualitative content analysis (where appropriate) are referenced to related findings from the empirical study (i.e., triangulated).

The role of observation in methods is argued by Silverman (2004) and Heritage (1984), both of whom consider that reliance on the 'verbal formulations of subjects' (Silverman, 2004, p.360) as no proper substitute 'for the observation of actual behaviour.' E-commerce web sites of firms in the portal group were observed over the course of the field trial for evidence of imitation or other reaction to innovations made by the portal.

#### *5.6.1 Interview procedure*

Written field notes containing observations and summarizing outcomes from pre-portal trial interviews with Ecotourism business owners were compiled during visits to the Cape Range Ningaloo region. The post trial interview worked on the basis of a standard question script and transcripts of interviews were made following interview. Questions were aimed at assessing the fitness for purpose and marketing of the quasi-experimental business solution, owner/operator attitudes toward the experiment and the experiment's impact on E-strategy. The script consisted of five questions:

- Did the portal deliver a usable (Q1) well designed (Q2) business solution?;
- Was the portal effectively marketed to the local E-Commerce community? (Q3);

- Did my strategy for doing business online change as a consequence of the portal project (Q4)?; and
- Did my attitude toward co-operating with other firms change as a consequence of the portal project (Q5)?

Perakyla (2004) describes issues in the reliability and validity of research based on naturally occurring social interaction and relevant precautions. To ensure the accuracy and reliability of the written record of interview, transcripts were mailed to subjects for correction/validation. The transcribed data was coded by key words derived from the research questions and literature on SME E-commerce adoption.

### *5.7 Social Network Analysis*

*Chapter Two* introduced social network theory and its application in understanding the phenomenon of economically significant innovation.<sup>97</sup> Social network analysis (Breiger, 2004, p. 506) is “the disciplined enquiry into the patterning of relations among different actors, as well as the patterning of relationships among actors at different levels of analysis (such as persons and groups).” Importantly, social network analysis can be used to analyse *information* and *knowledge* flows in a knowledge domain, the knowledge and social capital contained within the domain and nodes that function as brokers of knowledge sharing (Cross *et al.* 2003).

Adapted to the purposes of understanding the topology and characteristics of a C-commerce knowledge network, social network analysis displays promise as a method for understanding network behaviour and as an agent of catalysis in securing innovation outcomes. In this research the technique was applied as part of post-trial fieldwork with the aim of developing a richer

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<sup>97</sup> Vide Section 2.1.10, p. 48.

understanding of node (actor) behaviour in the informal knowledge network (Cross, Borgatti and Parker, 2003) described by portal nodes and their advisors.

#### 5.7.1 Network Analysis Methods

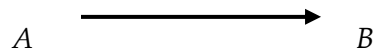
A network is defined as a single set of social actors (Breiger, 2004, p.507). Laumann *et al.* (1983) describe boundary specification methods for determining network boundaries. Both quantitative and qualitative analysis techniques can be employed in network analysis (Breiger, 2004, p.506). Quantitative analysis methods include both statistical and algebraic methods.

According to Breiger (2004, p.507) a type of relation is a set of social ties between actors of a particular type. In an informal network, as with other kinds of more formal networks, a tie can be regarded as a relation with attributes of *type*, *strength* and *direction*. In this study, tie analysis includes the ties of *knowledge(k)* (Borgatti and Cross, 2003), *interaction(i)* (Garton, Haythornthwaite and Wellman, 1997), *trust(t)* (La Micela, Roberti and Jacucci, 2003; Morgan and Hunt, 1994; Robbins, 2003; Rowe, 2004), *value(v)* (Borgatti and Cross, 2003) and *accessibility(a)* (Borgatti and Cross, 2003).<sup>98</sup>

*Interaction(i)* tie analysis (Garton, Haythornthwaite and Wellman, 1997) reveals the connections between people that can be used to build network models or *sociograms* of resource flows or influence. Figure 5.5 describes a dyadic *interaction* tie between nodes *A* and *B* in which *B*'s status as a *knowledge broker* on E-commerce adoption practice causes *A* to *interact* with *B* with the aim of acquiring domain knowledge. The strength of the tie can be measured as a scale, ordinal or nominal value representing the *frequency* of interaction or binary encoded as 1 or 0 to describe the *presence* or *absence* of interaction.

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<sup>98</sup> Vide Section 2.1.10, p.48.



**Figure 5.5 E-commerce Dyadic Tie (i) [A, B] [1,0]**

In this example, the direction of the tie is one way, indicating that while B has the status of a knowledge broker to A, the reverse does not hold. This kind of knowledge flow describes a classic client/consultant relationship. Direction can be *symmetric* (defining mutual trust) or *asymmetric* describing a one way connection in which one actor only has knowledge broker status. Figure 5.6 describes a symmetric relationship between A and B in which connection exists in both directions, i.e., exchange is reciprocal based on the *value* and *trustworthiness* of the information provided:



**Figure 5.6 E-commerce Reciprocal Tie (i) [A, B] [1,1]**

Galtung (1967) and Scott (1991) argue that the data matrix is the most appropriate way of holding social network data. Figure 5.7 describes a 4x4 case-by-case matrix (Scott, 1991, p. 42) representation of *Tie (i)* between four actors A, B, C and D in a hypothetical E-commerce knowledge network. The matrix depicts the reciprocal *interaction* tie between A and B dichotomously. A seeks information and knowledge from B, a relation that is reciprocated:

		<i>Tie i</i>			
		A	B	C	D
A		0	1	0	0
B		1	0	0	0
C		0	0	0	0
D		0	0	0	0

**Figure 5.7 Tie (i) Matrix (4x4)**



Relations can also be mapped. In a knowledge domain, matrices and maps describe (Brass, 1984; Burckardt and Brass, 1990; Krackhardt, 1990; Tushman and Romanelli, 1983; Breiger, 1976):

- knowledge consumers and brokers; and
- power and influence.

Inferences from social network mapping that are important in knowledge diffusion of innovation can be made on the basis of such analysis (Rogers, 1995). Analysis possibilities are richer when multiple tie types are incorporated into 'multiple network' formulations and compound relational ties are calculated (Breiger, 2004).

Epistemology provides competing definitions of knowledge. Review of Braun's (2003) work on SMTE networking showed the importance of *tacit* knowledge in informal ad-hoc networks. Thus, for the purposes of the analysis, a working definition was adopted comprehensive of both the *explicit* and *tacit* knowledge domains. This definition was provided by Prusak (1998) who viewed knowledge as:

a fluid mix of framed experience, values, contextual information, and expert insight that provides a framework for evaluating and incorporating new experiences and information. It originates and is applied in the minds of knowers. In organizations, it often becomes embedded not only in documents or repositories but also in organizational routines, processes, practices and norms.

(Cited Apostolou *et al.* 2005, p.186)

Thus, flows measured in the portal group in this study are inclusive of *tacit* knowledge and information concerning E-commerce theory and practice.

#### 5.7.2 Social Network Analysis Procedure: Quasi-Experimental Portal

Data gathering for network analysis was undertaken during the post-trial interview with the aim of deriving a better understanding of E-commerce information and knowledge sharing in the portal group. Data gathering was conducted by telephone interview. Quantitative data gathering focused on

the *relational*, *positional* and *centrality* influence weightings (Valente, 2005) that attached to nodal information and knowledge interchange. Network relations (Ties) used for construction of the sociometric data set were selected on the basis of previous studies that claimed validation of these measures (Borgatti and Cross, 2003; Garton, Haythornthwaite and Wellman, 1997). In *sociometric* data collection, for the portal trial period, nodes in the portal adopter group were requested to describe:

- *knowledge* attributable to other nodes in the network (whether the node ascribed E-commerce knowledge to other members of the portal group or otherwise);
- nodes from which they had *sought* E-commerce knowledge or information during the trial period;
- the number of *interactions* comprising this knowledge and information seeking behaviour during the trial period;
- rated *value* placed upon the knowledge or information obtained as a consequence of information and knowledge seeking behaviour;
- rated *accessibility* of other node(s) in the network for knowledge and information interchange;
- nodes from which they had *received* E-commerce knowledge or information requests during the trial period and the number of such requests;
- nodal interaction with nodes *outside* the local adopter network that involved E-commerce knowledge and information flows.

Data collection involved *dichotomous*, *scale* and *ordinal* types that could be organized into matrices and submitted to statistical and algebraic analysis. Analysis of tie behaviour in the portal adopter network was undertaken for

each dyad and also using aggregate methods (Hannemann, 2001). Whether a node in a knowledge network trusts the knowledge of another actor comprises confidential information. Since the release of such information may be harmful to an actor's reputation, both social network data and interview data were coded to protect the identity of subjects.

### 5.8 Limitations of Methods and Design

The limitations of research methods and design selected for this study include:

- limitations arising from the use of positivist, empiricist methods;
- limitations to do with triangulation such as the potential for the quasi-experiment to deliver a contradictory finding to that of the empirical survey;
- limitations arising from the role of known or suspect control variables outside the focal relationship not specifically accounted for by the design. For example, *multi-channelling* and *demographics*; and
- considerations of reliability that go with aspects of methods and design.

These limitations are explored in the following sections.

#### 5.8.1 Positivism, Empiricism and Interpretivism

While empiricism might be used to demonstrate a *strong* relationship between Cyber transformation and E-commerce value outcomes, the possibility of other explanations for such an outcome beyond the control of the research cannot be excluded.

In the empirical component of the study, sources of possible spuriousness include:

- factors in destination marketing not accounted for in the research design that may be responsible for the observation of significant *covariation* in Cyber transformation and E-commerce value creation outcomes; and
- confusion of cause and effect. Rather than a cause of financial success, higher levels of business transformation may merely manifest financial success attributable to other factors (such as *third* and other *independent* control variables).

#### 5.8.2 The limitations of triangulation

Silverman (1993) and Sarantakos (1998) describe the limitations of triangulation. One such limitation concerns the risk of a null or no finding from one triangulatory component, compromising confirmation of one or more hypotheses achieved with another component of the design. Triangulatory risk in this research includes but is not restricted to:

- a poor response from *E-commerce Adoption Survey* respondents; and
- failure of the quasi-experiment to achieve a critical mass of adopters sufficient for inferential statistical analysis of *pre* and *post* portal E-commerce value creation outcomes.

Factors such as:

- portal project funding (sufficient to enable the development of a 'proof-of-concept' solution only); and
- remoteness of the portal adoption group (located some 1200 kilometers from portal management)

placed limitations on the triangulatory value of the portal quasi-experiment. The adoption of qualitative methods for quasi-experimental analysis,

provided an additional data set that could be used in the event that insufficient adopters were attracted to the project.

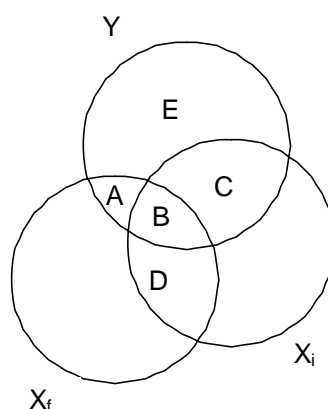
### 5.8.3 Focal relationship testing: Control or third variables

The relationship between Cyber transformation achieved online and E-commerce value creation is a focal relationship for this study. Focal relationship testing appears straight forward, but can be extremely demanding. As Aneshensel (2002, p.69) remarks:

The idea of a single focal relationship might be misinterpreted as simplistic. In actuality, the reverse is the case: Establishing that a single association is indicative of a causal relationship is a much more challenging task than demonstrating simultaneous association among dozens of variables. The latter is a straightforward empirical task that requires only technical knowledge of multivariate statistics.

If such a relationship could be found, then this would provide valuable direction to the industry on investment strategy for E-commerce.

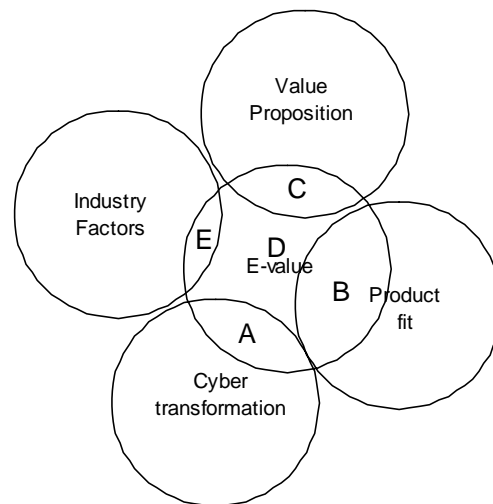
A challenge for research design is to account for the effects of *intervening* and *control* variables that emerge as possible sources of spuriousness. *Chapter Two* describes a number of measures aimed at improving domain validity; in reality, these are efforts to deal with variables that operate as *intervening* or independent *control* variables. The principle is demonstrated in Figure 5.8 where the effect on Y due to  $X_i$  is described by area A:



**Figure 5.8 Effect of Third Control Variable ( $X_i$ ) on the Focal Relationship**

(Aneshensel, 2002, p.59)

Assessment of an association between  $X_i$  and  $Y$  can only proceed on the basis of multivariate analysis that discounts the effects of covariation with the independent variable  $X_i$  described by area B, i.e., the contribution to the association shared by  $X_i$  with  $X_i$ . Figure 5.9, describes diagrammatically the contribution of four control variables to E-commerce value creation at work in the tourism online marketplace.



**Figure 5.9 Impact of control variables on E-commerce value creation (Brogan, 2004)**

In Figure 5.9, the amount of E-commerce value attributable to *Cyber transformation* is described by area A. The respective contributions of product fit, the value proposition, and industry factors are described by the areas B, C and E and the remaining area D is un-attributed (but may be thought of as including E-readiness and other unrepresented control variables).

Whilst the current design accounts for product fit, E-readiness, seasonal variation in E-commerce value creation and the value proposition, it does not attempt to deal with *multi-channeling* behaviour on the part of consumers, *web site marketing* or *demographic* factors.

An acknowledged limitation of the current design, therefore, is that observed variation in the independent variable, E-commerce value creation, isn't net of

the effect of independent control variables such as *multi-channeling, web site marketing or demographics*.

#### 5.8.4 Other considerations regarding validity and reliability

##### 5.8.4.1 Usability measurement

The existing research design operationalizes usability in terms of a handful of benchmarks. Systematic usability measurement would employ more benchmarks. The method of heuristic evaluation while valid, has declined in popularity in favour of methods based on scripted user testing and user and task analysis which are grounded in user reaction and experience. Heuristic evaluation is likely to be less reliable than user testing: However, heuristic evaluation was selected because the convening of user testing groups was not practical given the sample size.

##### 5.8.4.2 Web Metrics

The portal was applied in an industry sector where the use of metrics as a source of business intelligence is not an established practice. The reliability of data is extremely important in association testing and unreliable data can lead to the assertion of association where none exists and *vice versa*.

##### 5.8.4.3 Hawthorne Effect

The Hawthorne effect (Sarantakos, 1998, p.179), also known as the reactivity effect, is achieved where changes in the dependent variable are attributable to subjects knowing that they are being studied. In this experimental context, reactivity might take the form of actions taken by participants to redevelop or change an Internet PoP in response to field work presentations given on the project and the expectation of Cyber transformation driven improved transformation outcomes. Reasons for such activity might include:

- response to the perceived social desirability of a well constructed site; and

- internalization and acceptance of Cyber transformation principles and methods.

The Hawthorne effect is a potentially significant source of unreliability in the portal experiment. Activity by participating firms involving the redevelopment of sites in accordance with Cyber transformation methods, before baseline measurement or during the course of the study, could result in changes to the dependent variable not connected with portal adoption. The first presentations given on the project in the region occurred in December, 2002. To mitigate adverse consequences for the reliability of experimental data arising from the Hawthorne effect, it was decided to screen sites for significant changes after December 2002.

#### *5.8.4.4 Owner/operator estimates of E-commerce value creation*

In the Pilot Study, it was recognized that the accuracy of owner/operator estimates of revenue earned and sales leads varied with the importance of the Web as an income stream and overall operational excellence. It was not possible within the constraints of a study of this kind to quantify operator error in estimation of online income or sales leads. To improve reliability, telephone interview responses were transcribed and the hard copy of interviews was mailed to respondents with a request to check responses for accuracy, transcription errors, *et cetera*.

Nonetheless, it must be conceded that the accuracy of owner/operator estimates of revenue earned and sales leads is a source of potential unreliability. In common with Web metrics, the reliability of E-valuation creation data is extremely important in association testing and unreliable data could lead to the assertion of association where none exists and vice versa.

#### *5.8.4.5 Control of experimental conditions*

Systematic control over experimental conditions in field experiments involving real subjects is difficult to achieve. Only limited control could be



exercised over conditions under which the portal experiment was conducted. The exclusion of factors other than the independent variable introducing changes in the dependent variable could not be excluded. These factors included:

- the Hawthorne Effect (discussed in section 5.8.4.3);
- operational issues to do with system availability during the experimental period;
- the perceived social desirability to be doing well in E-commerce (subjects report higher levels of satisfaction and E-commerce value than is the case because of the perceived social desirability to be seen to be doing well when E-value creation outcomes are compared with outcomes achieved by peers); and
- owner/operator commitment to the experiment. The experiment entailed real costs to participating businesses in terms of creating and managing the portal presence. Hence, owner/operator enthusiasm could not be guaranteed over the life of the experiment.

#### 5.8.4.6 *Static v. Longitudinal analysis*

Some Cyber transformation scale measurements, such as the portal/directory count of referrer URLs, were taken only once, where repeated measurement might have been applied to improve reliability. Instances where this practice occurred were due to the limited human resources available to the project. With more resources, issues of reliability arising from the *static* nature of measurement might have been addressed in a *longitudinal* design in which measurement was repeated over prescribed time intervals. This limitation is characteristic of all static analysis.

#### 5.8.4.7 Limitations of network analysis

Social Network Analysis (SNA) is a way of attributing meaning to graphs that describe social groups. Skillicorn (2004, p.2) identifies three limitations of social network analysis methods, namely:

- the extraction of higher order meaning from nodal connections involves 'high level' abstraction;
- it is not easy to "introduce and use information that is not associated with the edge of a graph, such as demographic information"; and
- meaning attributable to graphs "typically depends on the precise connection structure of the graph, so that small changes in the graph may produce large changes in its properties."

Carley (2003) observes limitations in SNA's origins in the analysis of small bounded networks, encompassing 2-3 tie types and the requirement for perfect information to enable the construction of reliable sociograms. Carley (*ibid*) also regards SNA as essentially static, rather than dynamic.

The methods employed in this study are therefore subject to these acknowledged limitations of traditional SNA.

## 6 Research Methods and Design: Pilot Study

### *6.1 Overview of the Pilot Study*

In late 2002, nine firms from the Cape Range Ningaloo tourism region of Western Australia were recruited to participate in the portal quasi-experimental component of the transformation study. Firms were allowed to self-select for inclusion in the study because of the need for on-going commitment and cooperation, both of which were considered essential if the portal was to succeed in generating value to participating firms. Firms self-selected at presentations given on the portal experiment on 19 December 2002 and 9 April 2003. The pilot group included four firms with Nature and Ecotourism Certification under Ecotourism Australia's Nature and Ecotourism Certification Program (NEAP), and five firms that did not have NEAP accreditation at the survey census date.<sup>99</sup>

Analysis of the E-commerce value creation outcomes for these firms showed that:

- four of the nine firms were already successful on the Internet deriving 10% or more of their business from the B2C channel;
- five of the nine firms were deriving less than 10% of their business from the B2C channel and were dissatisfied with their E-commerce performance.

Comparison with B2C revenue data obtained for firms participating in the survey component of the research revealed that the portal quasi-experimental

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<sup>99</sup> The census date was 31 July, 2003.

group contained more firms deriving less than 10% of total revenues from B2C online (56%) than in the sample group (34%).

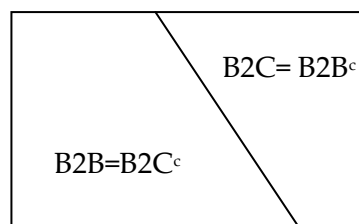
Firms participating in the portal quasi-experimental component of the study also formed the Pilot Study group for testing the validity and reliability of research instruments. This study resulted in a number of significant changes to instruments and the portal itself. These changes are summarized in Sections 6.2-6.4.

### 6.2 Firm profile and E-commerce Adoption Survey

This instrument was amended as a result of the pilot. The most significant changes were revisions that accommodated the multimodal character of online business done by firms involved in the pilot.

#### 6.2.1 B2B and B2C revenue streams

The pilot survey showed that firms derived income from retail (B2B) and consumer direct (B2C) channels using the Web and that this constituted the most typical mode of operation. The E-commerce value creation universe may therefore be thought of as consisting of the union of two disjointed sets corresponding to value created by the respective modes of B2B and B2C. Depicted as *complements*, this relationship is shown in Figure 6.1:



**Figure 6.1 E-commerce value creation (complements) (Brogan, 2005)**

Accounting for the relative importance of online business done via the respective modes is important because:

- Cyber transformation evaluation of B2B systems exceeds the scope of this study and is substantially impractical due to the confidentiality of data contained within these systems; and
- Cyber transformation evaluation is performed within the study using public data sets comprising E-commerce web sites and portals deployed *primarily* as B2C business solutions.

Changes made included the addition of a checkbox and fields aimed at gathering percentage distributions of retail versus business to consumer revenues. These changes affected Items 4.1-4.2 of the instrument.

#### 6.2.2 Return on Investments (ROI): Investment horizons

The original instrument was found to be coarse in the area of investment horizons. Some firms participating in the Pilot Study considered that the investment horizon for payback was less than 2 years and in one instance less than six months. Item 7.1 was amended to provide greater granularity in the measurement of investment horizon.

#### 6.2.3 E-commerce value creation tracking

E-commerce value creation measurement in this study relies on a mix of traditional financial measures and E-business metrics. Metrics used have been validated by other studies (Barua *et al.*, 2001; Golden, Hughes and Gallagher, 2003). During the Pilot Study, it became clear that some businesses kept E-commerce value metrics and could confidently assert E-commerce value creation outcomes over the report period, while other businesses could not, and responded with estimates. The problem was most acute with micro-businesses, which displayed less marketing acumen compared with SMEs in the Pilot Study. The possibly unreliable nature of data on E-commerce value

creation suggested the logic of including scales based on category measures for measuring value creation outcomes and satisfaction with B2C value creation. As a result Items 5.1.1-5.1.8 and 11.1 were added to the instruments.<sup>100</sup>

Work done with operators on E-commerce value creation during the Pilot Study also suggested a procedural change in administration of the E-commerce Adoption Survey to the sample group (n=108, N=150). To promote greater reliability in the estimation of E-commerce value creation, the decision was made to prepare hard copy of telephone interview responses. This copy was subsequently mailed to respondents, who were invited to reflect on responses made in the initial interview and to make changes, if on the basis of reflection, initial claims were seen to have been inaccurate.

### *6.3 Cyber transformation scale*

The Cyber transformation scale applied to E-commerce Web sites is reproduced as Appendix I.

#### *6.3.1 Rules for applying the scale*

Use of the Pilot Study group to test the Cyber transformation scale did not lead to changes in items, but to the production of rules intended to ensure consistent application of items across the sample. For example, in the absence of an interpretative rule, the existence of form mail would have been counted twice: firstly, as forms enabled client data acquisition in the Technological Capability transformation domain, Architecture cluster (Item 2.3); and, secondly, in the Interaction/Simulation cluster (Item 4.2). The rule adopted was that it be counted once only in the Interaction/Simulation cluster, preserving equality with other measures used.

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<sup>100</sup> Vide Section 5.4.7.4, p.170.

### 6.3.2 Alexa Traffic Rank and Google PageRank

The Pilot Study showed that three of the indices used in the *Discovery Cluster*, the Alexa Traffic Rank (Item 3.2.5), Reciprocal links (L2S) (Item 3.2.2) and Google PageRank (Item 3.2.3) would be sampled unreliably if treated as static measures. It was resolved to measure each on a once per month basis over three calendar months and to use the mean score recorded over the measurement period.

### 6.4 Cape Range Ningaloo Ecovortal

Field trips to the Cape Range Ningaloo region enabled user and systems testing of the experimental portal. Consequently, a number of system changes were deemed necessary. This section summarizes the principal changes made as a consequence of portal usability testing.

#### 6.4.1 Usability testing: Download Optimization

During the April 2003 visit to the Cape Range Ningaloo region, portal download times were scrutinized. Most users in the region operate over 34Kbps and 56Kbps analog connections. When operating optimally, these circuits deliver increased delay compared with equivalent circuits operating in major cities where proxy server and backbone connections ensure better performance. At Exmouth, the region's largest town and commercial hub, the portal splash page took fourteen seconds to load over a 56Kbps connection, a result exceeding the Macromedia industry benchmark of eight seconds used elsewhere in the study. The splash page was abandoned in favor of a new home page (main.cfm) sized at 21K that required eleven seconds to load. While slightly in excess of the Macromedia benchmark, load delay associated with the revised page was deemed acceptable by the Pilot Study group.

#### *6.4.2 Usability: Changes to user help*

The initial Acrobat (pdf) portal User Help proved subject to unacceptable download delay and had to be abandoned in favor of a much faster HTML solution.

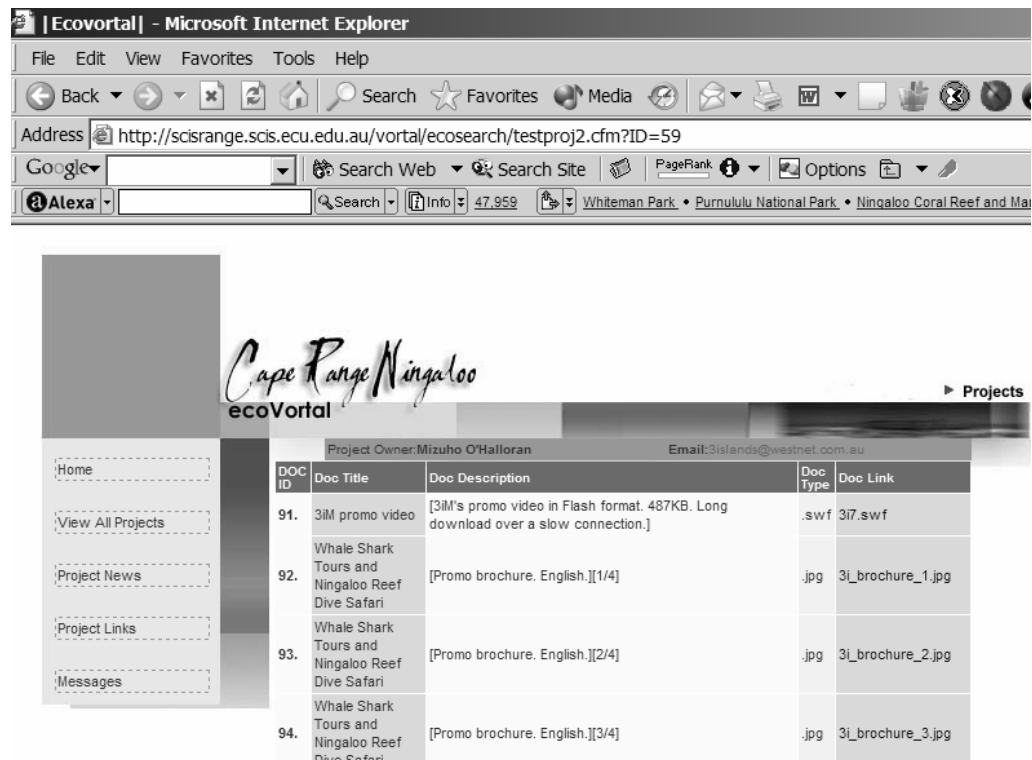
#### *6.4.3 Usability: Changes to project document inventory view*

The Pilot Study showed that the original approach to projection of project document inventories in a new browser window did not meet key usability requirements. Specifically:

- the existing template solution required significant scrolling with large document libraries; and
- the opening of a new window without a toolbar conflicted with an important standard use feature (availability of the back button) and, hence, could be confusing to novice users.

The document inventory view and template were re-designed to support standard use of the technology and to deal with the scrolling problem. In the new design, the inventory view opened in the default window with full use of the toolbar (see Figure 6.2):





**Figure 6.2 Revised inventory view describing standard use of the technology (Brogan, 2005)**

#### 6.4.4 Usability: Changes to the home page view

Review of user reaction to the portal, showed that keyword and thesaurus based searching of project document inventories was not typical of user behaviour and that a shortcut was required from the home page enabling visitors to gain a rapid appreciation of what the vortal had to offer. Accordingly, a *View All Projects* hot link was added to the home page providing a Google like report of all projects on the system organized by Project id and Project title (see Figure 6.3):

project id:	project title:	project description:	project access:	creation date:
13	<a href="#">Cape Range Ningaloo Vortal Systems Administration</a>	[Sys Admin site for this Ecoportal. Contains project documents and various bulletins on known systems issues.]	everyone	2002-08-16
18	<a href="#">spinifex plant diversity</a>	How rich are the spinifex grasslands of the Cape Range and other parts of arid Australia?	everyone	2002-09-11
30	<a href="#">Effect of No Fishing Zones in Ningaloo Marine Park</a>	This is my PhD project currently being conducted at ECU's Centre for Ecosystem Management. Refer to project summary for more information. See picture gallery for images of me doing research on coral reefs and fish at Ningaloo.	everyone	2002-09-18
35	<a href="#">History of Maude's Landing</a>	History of Maude's Landing	everyone	2003-01-08
36	<a href="#">Quad Treks</a>	Guided four wheel drive motor bike tour of Ningaloo Reef and Coral Bay. Activities include snorkelling and turtle viewing.	everyone	2003-01-08
37	<a href="#">Coral Breeze Coastal Cruises</a>	Natures way to explore the bay! Snorkel magical coral gardens, view astonishing marine life such as turtles, dolphins and rays.	everyone	2003-01-08
38	<a href="#">Four wheel bike adventures</a>	[Dune and reef safari with ATV Eco Tours.]	everyone	2003-01-08
40	<a href="#">Sea Breeze Resort</a>		everyone	2003-01-08
41	<a href="#">Whale Shark Eco Tour</a>	[Swimming with Whale Sharks is an experience of a lifetime. The season runs from April to June. You dont have be a diver to interact with Whale Sharks, as they generally swim just below the surface and all interaction is snorkelling]	everyone	2003-02-07
43	<a href="#">Birds of Cape Range</a>	[Project on the birds of CRN hosted by author Michael Morcombe.]	everyone	2003-02-12

Next>>

Figure 6.3 Hotlink view of All Projects on the System (Brogan, 2005)

#### 6.4.5 Usability: Java Cab file

During Project Owner/Subscriber registration, Windows remotely downloads a Java Cab File required on the client to support the ColdFusion Web Applications Server. This operation can take several minutes over a slow connection and can be confusing to new users who may in the absence of an alert respond to the event as a systems crash. To improve usability, an alert was added to the registration page advising of this one-off event.

### *6.5 Conclusion*

The Pilot Study revealed a number of validity and reliability issues requiring changes to instruments and the experimental component of the study. Principal among these changes were:

- changes to the *E-commerce Adoption Survey* instrument that enabled accounting of online revenues by mode of operation (Business-to-Consumer, Business-to-Business); and
- changes to portal design that enhanced portal usability.

The Pilot Study also revealed the need for rule making aimed at the consistent application of the Cyber transformation scale across the sample group.

## 7 Data analysis and interpretation I: Adoption survey and site evaluation

This chapter reports the results of analysis of data collected with scales. It also reports the results of hypothesis testing using empirical methods. The survey target population, survey sample construction method and design were described in *Chapter Five*. In presentation order, this chapter consists of:

- descriptive statistics describing results from application of the *E-commerce Adoption Survey*<sup>101</sup> to firms in the sample (Section 7.1);
- descriptive statistics describing results from application of the *Cyber transformation scale*<sup>102</sup> instrument to E-commerce Web sites in the sample using the methods of site inspection and evaluation (Section 7.2) ; and
- results and findings from testing of research hypotheses using bivariate and multivariate analysis methods (Section 7.3).

In inference testing, the significance of  $p$ -values was interpreted in accordance with the following table:

Table 7.1 $p$ -values and significance	
$p$ -value	Results
Greater then 0.1	Not significant
Between 0.1 and 0.05	Marginally significant
Between 0.05 and 0.01	Significant
Less than 0.01	Highly significant

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<sup>101</sup> *Appendix II.*

<sup>102</sup> *Appendix I.*

### 7.1 Data Analysis and Interpretation: E-commerce Adoption Survey

The sample was surveyed to determine the nature and kinds of E-commerce value created, the perceived impact of E-commerce in terms of operational excellence and the role of E-strategy in E-commerce decision making. The data are interpreted in terms of the literature on E-commerce adoption in tourism.

#### 7.1.1 Validation: Respondent and Non-respondent bias

A total of 46 firms participated in the *E-commerce Adoption Survey* by supplying one or more responses to survey items, representing a response rate of 42.6% (n=46, s=108). Data gathering proceeded by telephone interview with a follow up mail out of the full instrument, inclusive of responses made to the interview subset of questions. Metric data describe firm operations in the financial year 2002-2003. Assuming normal distribution of parameters in the population, the response rate was *insufficient* for assumption of a 5% representational error. Error was subsequently estimated at around 10%.<sup>103</sup> For reasons of commercial confidentiality and recordkeeping, item response rates differ from the aggregate survey response.

What differences existed between non-respondents and respondents in terms of selection parameters? Validation testing was performed with a cross tabulation of non-respondents and respondents (Tables 7.2 and 7.3), followed by a chi square test of association. Subsequently, this work was extended to include the additional factor of firm size as measured by number of employees (Table 7.4). Data gathering of firm size data for non-respondents was conducted by telephone interview in late 2004. The scheme adopted for

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<sup>103</sup> Vide Pearson NCS (2005). *Sample Size and Confidence Interval*. Retrieved 3 June 2004 from <http://www.pearsonncs.com/research-notes/sample-calc.htm>. Distribution of parameters was subsequently found to be asymmetrical.

classifying respondent firms by size was based on the Australian Bureau of Statistics (ABS) set of nomenclatures and definitions for SMEs (ABS, 2002a). Non-respondents are by their nature unco-operative with the goals of survey researchers. Hence, survey researchers face obstacles in comprehensively validating samples, particularly where no third party data can be used to fill in the spaces created by non-participation. In this research, parameters such as E-commerce value created and strategy yielded no *non-respondent* data and, hence, this forms an acknowledged limitation of non-respondent bias testing. Explanations for non-cooperation provided by non-respondents encompassed the confidentiality of the data requested, survey fatigue, costs involved in obtaining the information and disinterest in the project.

Table 7.2 Non respondents v. respondents by Region				
		Respondent (No/Yes)		Total
		No	Yes	
Region	ACT	1	0	1
	NSW	10	10	20
	NT	2	1	3
	QLD	31	21	52
	SA	6	4	10
	TAS	1	1	2
	VIC	3	3	6
	WA	8	6	14
	Total	62	46	108

Table 7.3 Non respondents v. respondents by Sector				
		Respondent (No/Yes)		Total
		No	Yes	
Sector	Tours	42	26	68
	Accomm.	10	12	22
	Tours &	6	6	12
	Attraction	4	2	6
	Total	62	46	108

Table 7.4 Non respondents v. respondents by Firm Size				
		Respondent (No/Yes)		Total
		No	Yes	
Size	Micro (1-4)	23	21	44
	(#Emp)			
	Small (5-19)	16	19	35
	Medium (20-99)	10	3	13
	Medium (100-200)	1	3	4
	Total	50	46	96 <sup>104</sup>

The data were recoded to account for small frequencies (< 5) in some cells. A Pearson Chi Square test was used to test the consistency in each measure between respondents and non-respondents. Test outcomes ( $\chi^2$ ; degrees of freedom (df);  $p$ -value) for each parameter are shown in Table 7.5. None are significant at the  $\alpha = 0.05$  significance level. Thus, it is concluded that non-respondents were *not* significantly different from respondents in terms of the three parameters of region, sector and firm size.

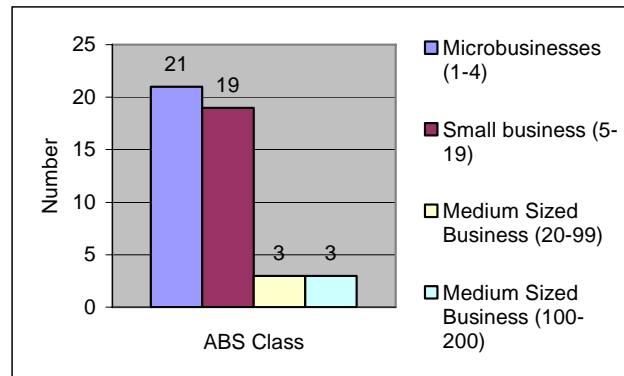
Table 7.5 Pearson Chi Square: Non respondents v. respondents			
Metric	$\chi^2$	df	$p$
Region	0.578	3	0.901
Sector	1.839	2	0.399
Firm size	1.655	2	0.437

### 7.1.2 Further observations on firm size

Of the 46 firms that responded to the survey, 21 (45.652%) comprised micro-businesses employing at most four people. A further 19 (41.304%) comprised small businesses employing between five and nineteen people and the remaining 6 (13.044%) comprised medium sized businesses.

<sup>104</sup> Twelve non-respondents declined to supply firm size data.

Figure 7.1 describes the distribution by number of employees:



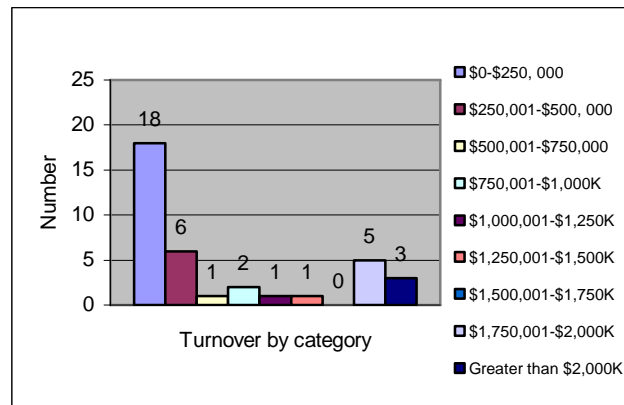
**Figure 7.1 Number of employees (class, number)**

Thus, in terms of firm size, 86.956% of responding firms comprised micro or small businesses. Work by Corigliano and Baggio (2002a) on online outcomes in Italian SMTEs and Burgess, Copper and Alcock's (2001) study of Australian SMTEs suggests the likelihood of low order Cyber transformation outcomes in a sample with such a respondent profile. Section 7.3.1 reports summary statistics for Cyber transformation found in the sample.

#### 7.1.3 Firm size: Turnover

Thirty seven firms ( $n=37$ ) were prepared to declare firm turnover. For reasons of commercial confidentiality, the response rate for this item was lower than for other items. Notwithstanding the slightly lower response rate, the data presents a picture consistent with firm size by number of employees. Figure 7.2 describes firm turnover by category. Twenty four firms (64.865%) have turnover under \$500K and ten firms (27.027%) have turnover in excess of \$1m.





**Figure 7.2 Firm turnover (category, \$)**

#### 7.1.4 Modes of operation

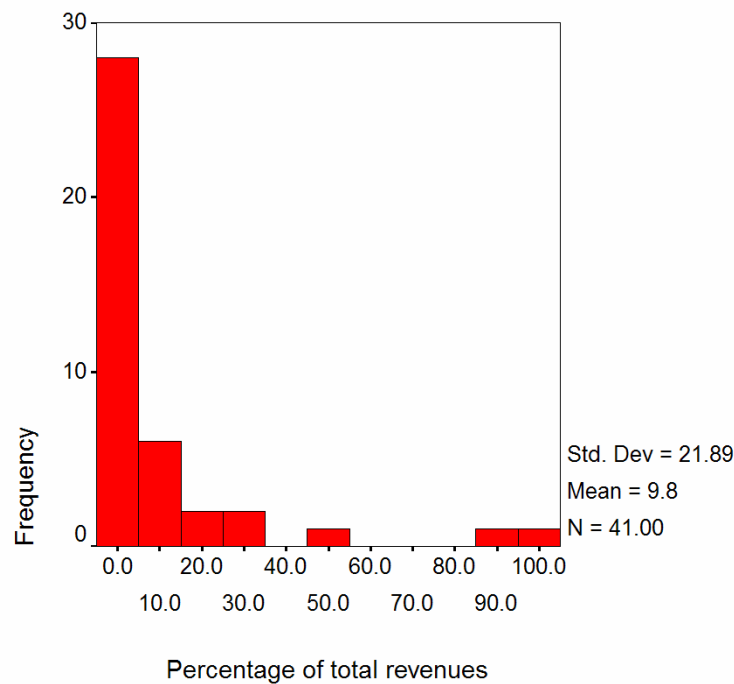
Forty four firms ( $n=44$ ) responded to this question. Ten firms (22.727%) were found to be involved in consumer direct (B2C) *only* operations. The remaining thirty four firms (77.273%) operate in mixed mode involving a combination of *retail* (B2B) and *consumer direct* (B2C) operations.

#### 7.1.5 E-commerce value creation

Firms participating in the survey were asked to estimate the percentage of *total* revenue from *all* sources earned online in B2B and B2C modes respectively.

##### 7.1.5.1 B2B online revenues as a percentage of total revenue

Forty one firms ( $n=41$ ) involved in B2B online operations were able to describe the importance of online in terms of total B2B revenues. Figure 7.3 describes these responses in frequency histogram form.



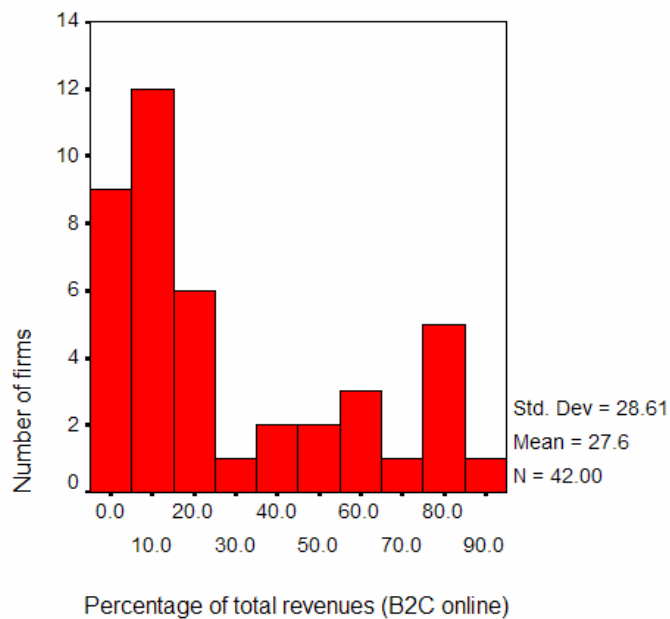
**Figure 7.3 B2B online revenues**

The histogram and summary statistics (median=1.000%, mode=0.000%, skew=3.170) show that B2B online is a *minor* revenue channel for most operators and that the distribution is heavily asymmetric and clustered around low values. Inspection of the frequency table shows that 73.170% of respondents derive 5% or less of their revenues from B2B online. The B2B maximum of 98.000% was recorded by a firm that specialized in the North American market, retailed product to other businesses lower in the value chain and did very little B2C E-commerce (2.000%).

The result is consistent with firm profile data that shows a majority of micro and small businesses located at the bottom end of the supply chain providing product and services to consumers. In interviews, respondents also commented that fax and telephone were mostly preferred by travel agents for the communication of bookings, rather than online systems.

### 7.1.5.2 B2C online revenues as a percentage of total revenues

Forty two firms ( $n=42$ ) involved in B2C online operations were able to describe the importance of B2C online in terms of total B2C revenues. Figure 7.4 describes these responses in frequency histogram form.



**Figure 7.4 B2C online revenues**

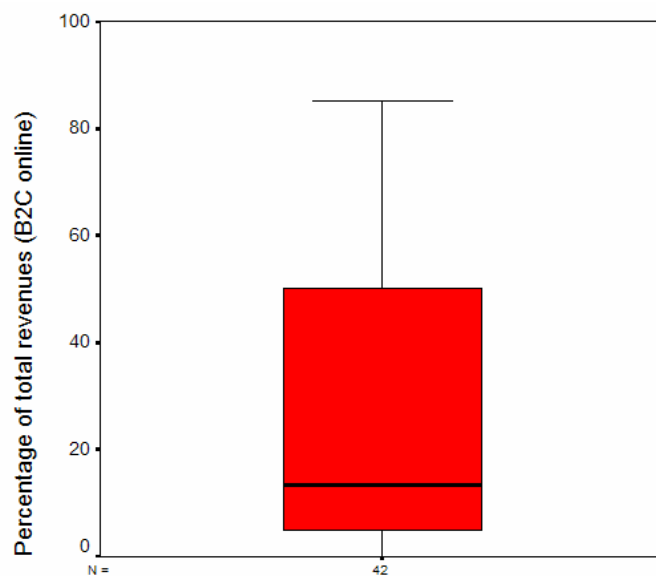
Since around one quarter (23%) of responding firms operate in consumer direct (B2C) mode only, and all firms have a self interest in maximizing consumer direct revenues,<sup>105</sup> the data were expected to show a higher proportion of the total revenue mix coming from B2C online activity.

This prediction was born out by frequency table and summary data, where the proportion of responding firms earning 5% or less of total revenues from B2C online activity shrank to 33.333%, compared with 73.170% for B2B. Twenty four per cent (23.810%) of firms responding were found to be earning more

<sup>105</sup> Consumer direct sales do not involve agent's fees and hence are lower cost compared with retail.

than 50% of their total revenues from online B2C activity, compared with 4.878% in B2B mode. For the majority of survey respondents, B2C online revenue is more important than B2B online revenue as a proportion of total revenues earned. Two responding firms comprised retail business deriving 90% or more of online revenues via the B2B channel with very low levels of B2C online revenues.

However, the number of businesses recording low levels of B2C online revenue remains high, with 33.333% generating 5% or less of total revenues from this channel and 47.619% earning 10% or less of total revenues. Skewness (0.850) and Standard Error of Skewness (0.365) display clustering around low levels of B2C in an asymmetric distribution. Inspection of the box plot reinforces the view of an asymmetric distribution (see Figure 7.5).



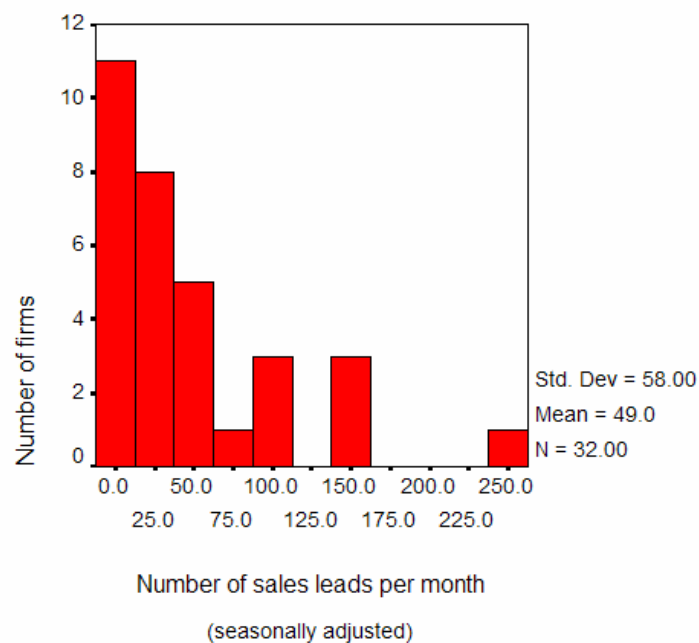
**Figure 7.5 Box plot of B2C Revenues**

Clearly, the majority of firms are underperforming relative to a minority of strong performers, but the data on B2C revenues also support the view (TIA, 2002; Roy Morgan, 2003) that tourism has excellent E-retailing potential. For example, the median figure recorded for B2C revenues as a percentage of total

revenues in this study (13.500%), is more than three times the OECD (2003, p.12) multi-industry maximum of 3.8%. Results are also extremely favourable when compared with the European tourism average reported by Corigliano and Baggio for 2002 (2003, p.86) of 2.8%.

#### 7.1.5.3 Sales leads

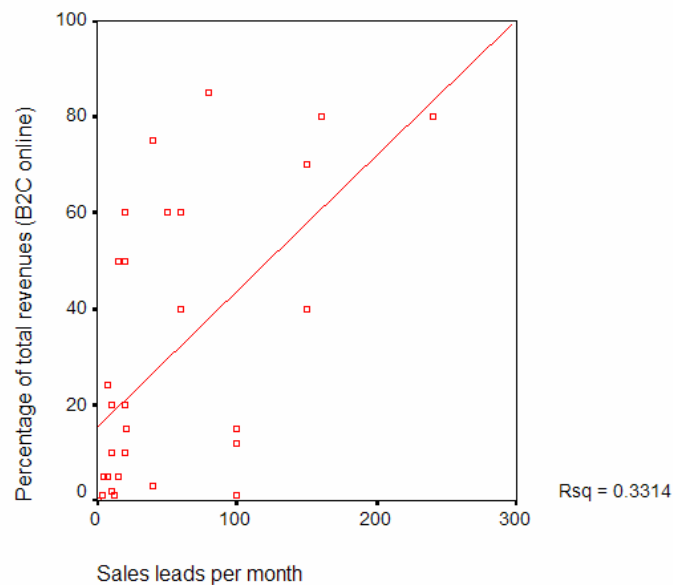
The second measure used to determine E-commerce value creation outcomes comprised the number of B2C sales leads (requests for information from prospective customers) received online as email. Firms were asked to estimate leads inclusive of those leads that generated sales and leads that did not. Firms were also requested to adjust estimates to account for seasonal factors, i.e., to supply an estimate of average leads per month calculated over the financial year to which the data related. Thirty two firms ( $n=32$ ) involved in B2C online operations were able to calculate online sales leads, as a seasonally adjusted estimate of the number of leads received per month. Figure 7.6 describes these responses in frequency histogram form.



**Figure 7.6 Histogram of B2C online sales leads**

The data display positive skewness (1.732) and kurtosis (2.742) characteristic of an asymmetric, low-end heavy distribution. The smallest mode (10.000), median (20.000) and Standard Deviation (Std. Dev.) (57.997) are also consistent with this observation.

Around one third (31.250%) of firms receive 10 or less sales leads per month and 56.250% receive less than 20. The top performing site in terms of this metric received 240 mails per month and the lowest figure recorded was one. Around 31.250% of businesses recorded more than 50 sales leads per month. A scatter plot of sales leads versus B2C revenues is reproduced as Figure 7.7.



**Figure 7.7 Sales leads v. B2C revenues**

A 1-tailed correlation test with Spearman's Rho showed a strong positive relationship between sales leads and B2C ( $n=31$ ,  $\rho=0.615$ ,  $p=0.000$ )<sup>106</sup> revenues at the  $\alpha = 0.01$  confidence level, suggesting basic reliability in the

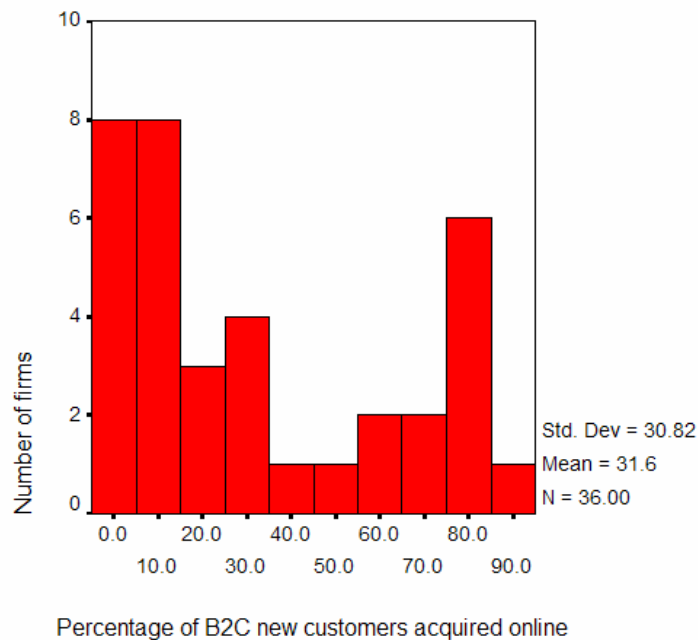
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<sup>106</sup> In SPSS,  $p$  values  $< 0.0005$  are rounded in output to  $p = 0.000$ . The reader should note that this, and subsequent, instances of  $p = 0.000$  are rounded, rather than actual values.

data. Firms performing well in terms of sales leads are also top performers in terms of B2C revenue generated. Conversely, firms performing relatively poorly in terms of sales leads, generated less revenue than their better performing sales leads counterparts.

#### 7.1.5.4 B2C new customers acquired online

Thirty six respondents ( $n=36$ ) were able to supply a percentage value for new customers acquired online, as a percentage of all new customers acquired for the financial year 2002-2003.<sup>107</sup> Figure 7.8 describes the data gathered in frequency histogram form.



**Figure 7.8 Histogram of B2C new customers**

The histogram and summary data describe a distribution that is positively skewed and emphasizes inferior outcomes. Inspection of the frequency distribution shows that 36.111% of responding firms acquire 5% or less of their

<sup>107</sup> The survey year i.e. the financial year 1 July, 2002 to 30 June, 2003.

new customers from online activity and almost two thirds (63.888%) acquire 33% or less of customers in this way.

The test for data reliability employed with B2C revenues and sales leads was extended to new customers acquired online and B2C revenues. Reliable data was expected to display *highly* significant positive association between B2C revenues and new customers and the strength of association as measured by *rho*, was expected to approach the theoretical maximum value of 1.000. A 1-tailed correlation test with Spearman's Rho confirmed both predictions ( $n=36$ ,  $\rho=0.948$ ,  $p=0.000$ ), suggesting basic reliability in the data.

#### 7.1.5.5 Return on Investment

The fourth measure of E-commerce value creation adopted for the study was Return on Investment (ROI). However, no usable data was collected for this measure. This response precluded inference testing for association between ROI outcomes and Cyber transformation outcomes. Responding firms were, however, able to estimate time taken to achieve *payback* on E-commerce investment and this metric is used in subsequent analysis. Payback is defined as (Industry Canada, 2003, p.1) "the length of time required for the net revenues of an investment to return the cost of the investment."

#### 7.1.5.6 Summary: E-commerce value creation outcomes

Across the three measures of E-commerce value creation for which data was gathered, outcomes are positively skewed, describing a trend in the sample towards asymmetric, bottom heavy E-commerce value creation outcomes. The data also show that while most firms record low levels of success against the three measures of B2C revenues, sales leads and new customers, some respondents are recording high levels of success. For example, data show that around twenty four per cent (24%) of firms are earning more than 50% of their total revenues from online B2C activity (Figure 7.4). The data also show that B2C online revenues comprise a more important revenue stream than B2B

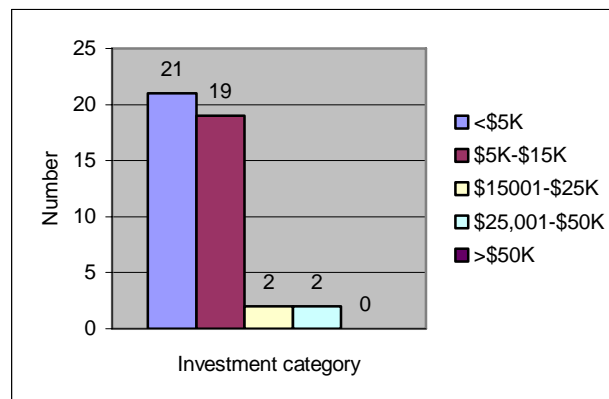


online revenues, for which other channels (telephone, fax) are preferred (Figure 7.3).

Clearly, some firms have discovered how to unlock the potential of the Web to generate consumer direct sales and are enjoying success. The clear majority, however, are less successful relative to top performers and around one third are generating activity only slightly better than the OECD multi-industry/sector average. Whether Cyber transformation theory provides the explanation of this phenomenon, is a core investigative task for this study. The question is revisited later with inferential analysis in section 7.3.3.

#### 7.1.6 E-commerce investment- Are firms under investing in online?

Respondents were asked to categorize their investment in E-commerce systems in terms of establishment budgets. Figure 7.9 describes the responses of the forty four (r=44) respondents by category.



**Figure 7.9 Establishment budgets**

The data describe a picture of modest investment in online, with 47.727% of respondents spending <\$5K, and with another 43.182% of firms estimating systems investment in the range of \$5K to \$15K. Only 9.091% of responding firms have invested more than \$25K on E-commerce and none have spent more than \$50K.

Such a profile suggests many of the low level transformation outcomes reported across the *Technological Capability (TC)* and *Strategic Business (SB)* dimensions of the *Marketspace Model*.<sup>108</sup> Chapter *Three* described a sequence of National Office of Information Economy benchmarks for SME spending on E-commerce web sites.<sup>109</sup> In terms of the industry watchdog benchmarks, 47.727% of firms appear to be underspending on their E-commerce establishment budgets.

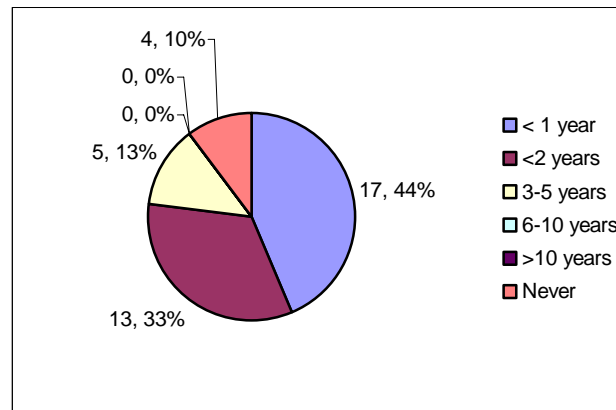
#### 7.1.7 E-commerce Payback

As discussed in section 7.1.5.5, only two firms in the sample had performed an ROI calculation and were able to quantify return on their investment in Web E-commerce. Data gathering was more successful with *payback*. Data gathered from respondents (n=39) show that even with low levels of investment and low levels of E-commerce activity (33% of firms are earning less than 5% of B2C revenues from online), most firms have generated payback within 1 or 2 years. Only four firms, representing 10% of respondents, considered that they would never obtain payback on their investment. Figure 7.10 describes payback periods for respondents in the sample.

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<sup>108</sup> Vide Section 7.2, p.221.

<sup>109</sup> Vide Section 3.3.3, p.109.



**Figure 7.10 Payback (n, % by category)**

*Ceteris paribus*, relative to others firms, a firm was expected to achieve payback faster if it generated more of its income from B2C online, acquired more new customers from online and generated more online sales leads. Thus, payback was expected to demonstrate an inverse relationship with the three measures of E-value creation for which quality data was obtained. However, no significant associations existed at the significance level  $\alpha=0.05$ . Controlling for establishment budgets in a test of partial correlation with 1-tailed Spearman's Rho, still no association existed at the significance level:

Table 7.6 Payback (Controlling for Establishment Budgets)			
Metric	n	rho	<i>p</i>
B2C revenues	22	-0.305	0.927
Sales leads	22	-0.313	0.933
New customers	22	-0.323	0.938

#### 7.1.8 E-commerce strategy

In common with the Golden, Hughes and Gallagher (2003) study, firms were asked whether they had a formal strategy for doing E-commerce. In their study of E-retailing in the Irish arts and crafts industry, Golden *et al.* (2003)

had found that 54% of firms had an E-business strategy while 46% had no such strategy.

E-strategy adoption in this study of Australian Ecotourism industry appears less common. Of the forty firms ( $n=40$ ) that responded to this question, 14 (35.000%) had an E-strategy and 26 (65.000%) had no such strategy. Thus, percentage outcomes are similar to those reported by Korchak and Rodman (2001).

However, the standard set for the current study was a written strategy contained in a Business or E-business plan, a standard that excluded firms claiming E-strategy, but which had not moved to document this strategy. Such a high standard may explain the lower percentage adoption outcome compared with Golden *et al.* (2003).

## 7.2 Data analysis and interpretation: E-commerce Web site inspection and evaluation

A *B2C Cyber Transformation Scale* (Appendix I) was used to measure Cyber transformation achieved by firms participating in the survey component of the study.

The respective dimensions were the:

- Technology Capability (TC) dimension;
- Strategic Business (SB) dimension; and
- Usability (U) dimension.

The Usability dimension was not a feature of the original *Marketspace Model*, but postulated as necessary for domain validity of the model in the light of

recent research.<sup>110</sup> The performance of each firm in the sample was measured against the scale, resulting in an SB dimension, TC dimension, U dimension and an overall Cyber Transformation (CT) score. Scores are continuous values on the scale:

- 0.000-23.000 (TC Dimension);<sup>111</sup>
- 0.000-30.000 (SB Dimension);<sup>112</sup>
- 0.000-9.000 (U Dimension).<sup>113</sup>

Most scale items translated as dichotomous values depending on whether the item was satisfied (1) or not satisfied (0). Items with non-dichotomous ordinal values, such as traffic ranks and portal counts were captured as a PERCENTRANK<sup>114</sup> in Excel with values in the range 0.000 to 1.000. A similar transformation is used by Google in the treatment of Page Rank.<sup>115</sup> The dimensional score is the sum of all item scores within the dimension. Weighting of the scale in terms of items is consistent with Dutta and Segev's (2001) original theory, which placed greater emphasis on business transformation than technological capability. Weighting of the revised

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<sup>110</sup> Vide Section 2.3.4.2, p.69.

<sup>111</sup> Vide Section 5.4.4, p.161.

<sup>112</sup> Vide Section 5.4.5, p.164.

<sup>113</sup> Vide Section 5.4.2, p.156.

<sup>114</sup> Returns the rank of a value in a data set as a percentage of the data set.

<sup>115</sup> Rogers, I. (2005). *The Google Page Rank Algorithm and How it Works*. Retrieved 8 July, 2005 from <http://www.iprcom.com/papers/pagerank/>.

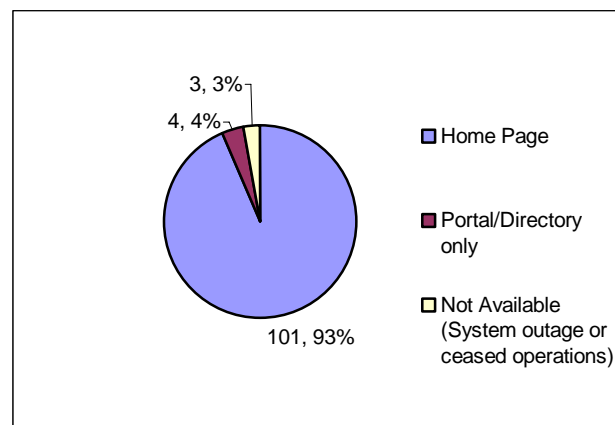
instrument is also consistent with Dutta and Segev's (2001) original Cyber transformation scale. Hence, normalization of dimension scores was rejected as an option for data transformation.

### 7.2.1 Technological Capability Dimension

This section provides an overview of transformation achieved by firms in the sample across items contained in the TC component of the Cyber transformation scale.

#### 7.2.1.1 Internet Point-of-Presence

The Internet PoP profile of the sample (s=108) is 93.519% per cent owner/operator with a further 3.704% based on portal/directory services operated by government or portal service providers (see Figure 7.11).



**Figure 7.11 Internet PoP (n, %)**

The data suggest high levels of adoption of the Web channel by operators as part of destination marketing strategy. The result accords with industry research (Tourism Queensland, 2000; Travel Industry Association, 2002) showing the importance of the Internet in tourism destination marketing. Adoption levels are also comparable with levels reported by Pechlaner *et al.* (2003) in a recent European study on Italian SMTE E-commerce adoption. The strong preference for a home page as the locus of E-commerce, as opposed to

portal or directory only Internet PoP, was not the subject of a research question. However, the literature review canvasses existing research into the practical and attitudinal issues that underpin this phenomenon<sup>116</sup> and fieldwork, conducted as part of the portal quasi-experiment, provides additional insight.

The results in terms of Internet PoP, as measured by site inspection, show a high level of commitment to the Web as a business channel in this industry/sector.

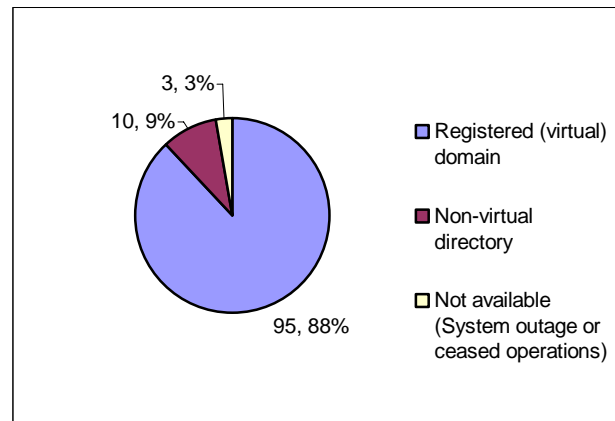
#### 7.2.1.2 Registered domains

Commitment to E-commerce involves some degradation when ownership of a registered domain is adopted as a criterion. Of the sample, 87.963% of sites were based on a registered domain owned by the business, a further 9.259% were non-virtual directories<sup>117</sup> and 2.778% could not be attributed due to unavailability (see Figure 7.12).

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<sup>116</sup> Vide Section 3.3.1, p.104.

<sup>117</sup> A *virtual* website is one that is accessed through a domain name (e.g. [www.mydomain.com](http://www.mydomain.com)). A *non-virtual* site may be of two types, a subdomain name (e.g. [www.mydomain.somedomain.com](http://www.mydomain.somedomain.com)), or a subdirectory of a domain (e.g. [www.somedomain.com/mysite](http://www.somedomain.com/mysite)).



**Figure 7.12 Virtual and non-virtual domains (n, %)**

#### 7.2.1.3 Architecture and enabling technologies

The sanguine picture painted by Internet PoP and domain registration fades when the nature of enabling technologies is measured. Of the sample (s=108) sites:

- 29 (26.851%) consist of static HTML with no DHTML features. A further 73 (67.593%) contain dynamic features and 6 (5.556%) were unavailable for inspection for reasons of system outage or cessation of business operations;
- 10 (9.259%) are gateway scripted involving DBMS and some degree of backend integration. A further 92 (85.185%) involved no DBMS integration and 6 (5.556%) were unavailable for inspection for reasons of system outage or cessation of business operations;
- 34 (31.481%) do not employ HTML forms for mail or client data acquisition. A further 68 (62.963%) contain dynamic features and 6 (5.556%) were unavailable for inspection for reasons of system outage or cessation of business operations; and



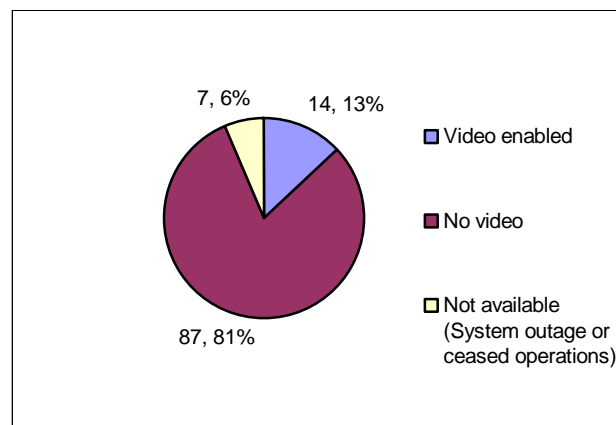
- *none* incorporate styles or views supporting access over mobile (wireless) user agents.

The low incidence of scripted database suggests high levels of redundancy in terms of information found on web sites and low levels of functionality available to users. The one third of sites that do not use *HTML forms* rely upon *mailto* links for customer contact (a fundamental Usability issue) and do not provide any of the functionality, customization or personalization identified with sites that gather data from the client using forms.

The architecture and enabling technologies profile suggests many legacy sites that do not meet current standards for good practice in the implementation of E-commerce enabled web sites (Amor, 2002, p.450).

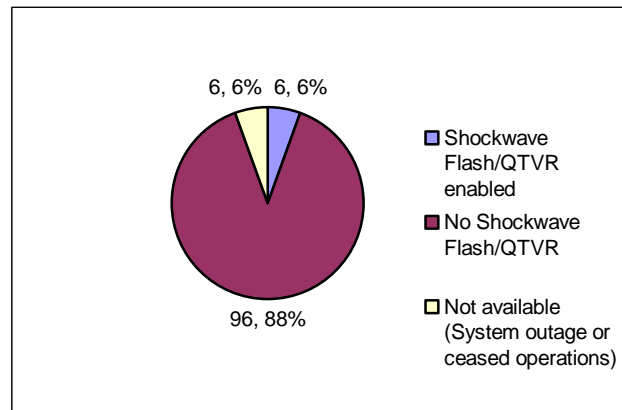
#### 7.2.1.4 Multimedia, simulation and immersive interaction

*Chapters Two and Three* described the nature and potential applications for multimedia, simulation and interactive technologies in tourism web sites. But the enthusiasm shown in the tourism related literature (Rayman-Bacchus and Molina, 2001; Gretzel and Fesenmaier, 2003; Buhalis 2003) for multimedia, simulation and immersive interaction in tourism related web sites was not found in the sample. Only 12.963% of sites are video enabled (see Figure 7.13).



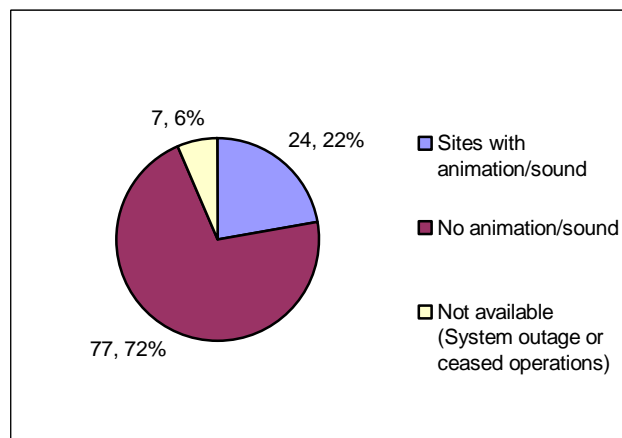
**Figure 7.13 Multimedia (Video) (n, %)**

Of the sites inspected, only 5.556% were found to be using simulation or immersive interaction in site design (Figure 7.14).



**Figure 7.14 Immersive Interaction/Simulation (n, %)**

Animation (typically GIF) and sound (background) were found to be more common in the sample (see Figure 7.15).

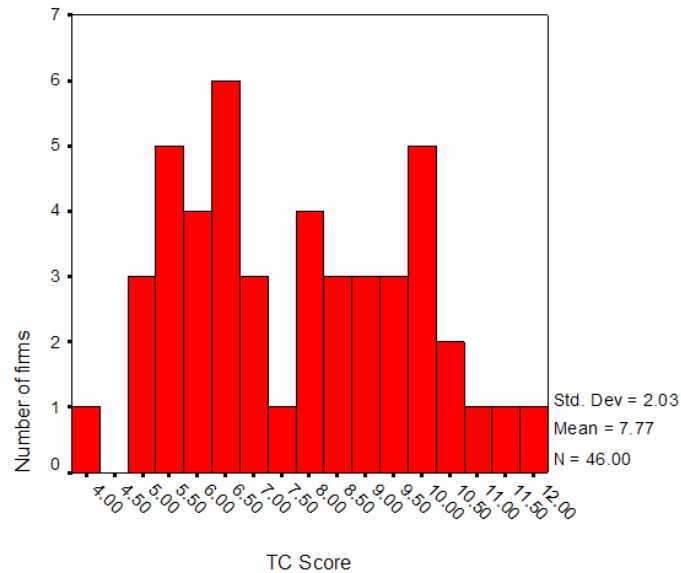


**Figure 7.15 Animation/Sound (n, %)**

Results on multimedia, immersive interaction and simulation are consistent with the low level transformation outcomes found with site architecture and enabling technologies.

### 7.2.1.5 Summary statistics: Technology Capability (TC) Dimension

Figure 7.16 is a frequency histogram describing the distribution of TC dimension scores of firms providing one or more measures of E-value creation:<sup>118</sup>



**Figure 7.16 Frequency histogram of Technological Capability**

An overall TC score was calculated from cluster scores (Architecture and Internet technologies, Discovery, Multimedia and Interactivity/Simulation). The TC score exists on the scale 0.000-23.000. The Mean (7.770), Median (7.748), Std. Dev. (2.032) and Skewness (0.231) describe a distribution with normal tendency at the low end of the TC scale. The maximum value recorded on the 23 point scale was 12.181 and the minimum was 3.879.

Performance is weak in terms of Internet enabling technologies (the use of database and dynamic features), Interactivity (forms and other technologies that provide for reliable feedback, client data acquisition for

<sup>118</sup> Vide Section 5.4.1, p.154.

personalization/customization), Multimedia (video, animation and sound), Simulation (Flash, QT-VR) and Channels (the wired desktop is the only user agent recognized). Performance improves in the Discovery cluster, where some firms were found to be using Search Engine Optimization strategy and knowledge diffusion of good practice (for example, in the use of metadata) is more evident.

#### 7.2.2 Strategic Business dimension

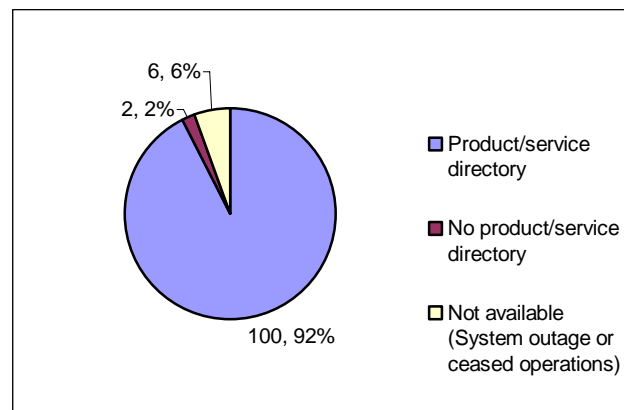
The Strategic Business (SB) dimension was operationalized around the Four P's of the *Marketspace Model* (Product, Place, Price and Promotion) plus Customer relations. All items in the SB section of the scale are dichotomous with values of 1 or 0 depending on whether the item was satisfied or otherwise. The theoretical maximum score achievable by a firm on the SB axis was 30.000, compared with 23.000 on the TC axis.<sup>119</sup> Data for measuring SB transformation was gathered from site inspections and the *E-commerce Adoption Survey* (Appendix II).

##### 7.2.2.1 Product transformation

Of the 108 sites in the sample, 100 (92.593%) contain a directory of products/services (see Figure 7.17). Scope for product customization was clearly conveyed by sites selling tours that invited prospective customers to construct tours around variables such as itineraries and interests. However, no tools enabling customer product or services customization were found on any of the sites in the sample. The potential for product or services customization is currently unrealized in this industry sector. Uniform approaches to product transformation functionality suggest a lack of variance in the data. No usable data could be obtained on customer input to specification and design and this item was omitted from the count.

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<sup>119</sup> Vide Section 7.2, p.222.



**Figure 7.17 Business transformation: Online directory of products (n, %)**

#### 7.2.2.2 Promotion transformation: Online alliance advertising

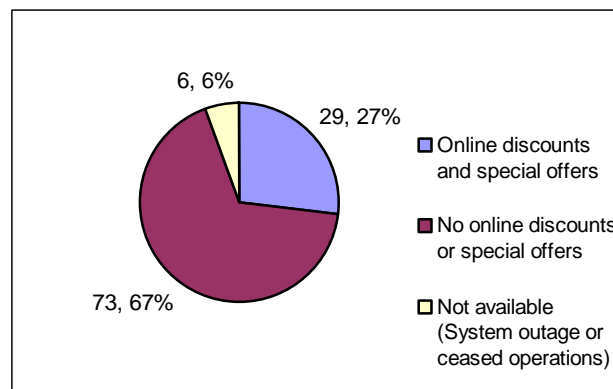
Firms that participated in the *E-commerce Adoption Survey* supplied information on advertising and other aspects of marketing and promotion. Forty five firms ( $n=45$ ) responded to this question. A firm was considered to be involved in online *alliance* advertising, if it was party to reciprocal agreements with other firms that enabled advertising on partnered sites. Twenty four firms (53.333%) did not participate in alliance advertising and a further 21 (46.667%) had put in place such arrangements.

Alliance advertising is no cost or low cost compared with search engine banners and other forms of paid advertising on the Web. It was expected that this form of advertising would be more common than banner, popUp or other forms (De Waal, 2004; Papatla and Bhatnager, 2002). The data showed this expectation to be the case with a clear majority of respondents (62.963%) having no arrangements in place for paid advertising on the Web and only (37.037%) involved in this practice.

In interview, respondents expressed a variety of positions on Internet advertising. Of the firms that had experimented with Internet advertising, some had abandoned it for reasons of cost and return. Knowledge of the role played by advertising in destination marketing on the Internet was less than

perfect in non-adopters. For example, some operators were unaware that banner adverts on popular search engines such as Google, could be used to address problems with discovery arising from inferior page rankings.

Internet direct marketing via E-mail or cellular systems was uncommon in responding firms. Of forty six (r=46) respondents to this question, only six (13.043%) had employed Internet direct marketing with forty (86.957%) having never used Internet direct marketing. Promotional marketing, involving discounts and special offers to online customers was identified in 73 firms representing 67.593% of the sample (see Figure 7.18).

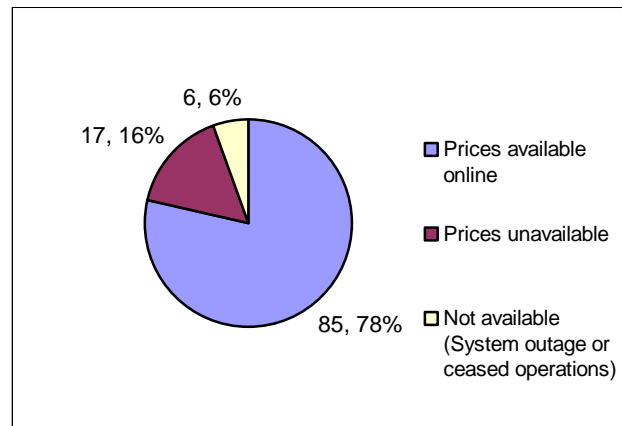


**Figure 7.18 Promotion transformation: Online discounts and special offers**  
(n, %)

Interviews with respondents who participated in the E-commerce Adoption Survey indicated that while many operators could see the potential for online discounting, existing arrangements with retailers often precluded promotional marketing in this way. Others saw themselves as operating in a premium market and were less concerned with price leadership.

#### 7.2.2.3 Price Transformation

Prices were available online for 85 firms, representing 78.704% of the sample. A further 17 firms (15.741%) did not publish prices (see Figure 7.19).

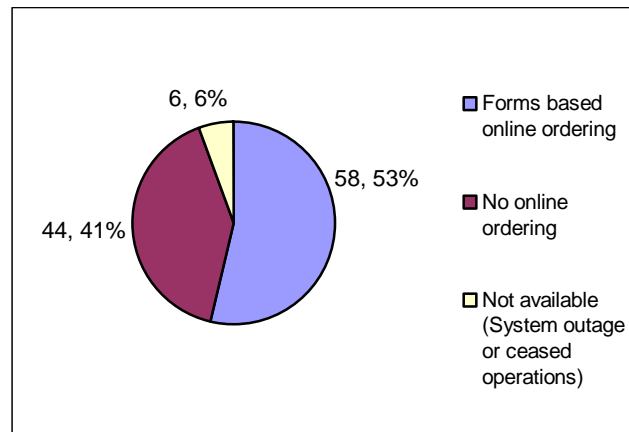


**Figure 7.19 Price transformation: Online prices (n, %)**

Thus, there is a high degree of price transparency in the sample, enabling consumers to make decisions about the value proposition in 78.704% of cases. However, no examples of dynamic price customization or E-markets could be found in the sample, suggesting that the potential of the Web for price transformation is unrealized in this industry sector. The lack of variance seen with scores in the Product transformation cluster is repeated in the Price cluster (Mean= 0.790 Std. Dev.= 0.411; Var.= 0.169).

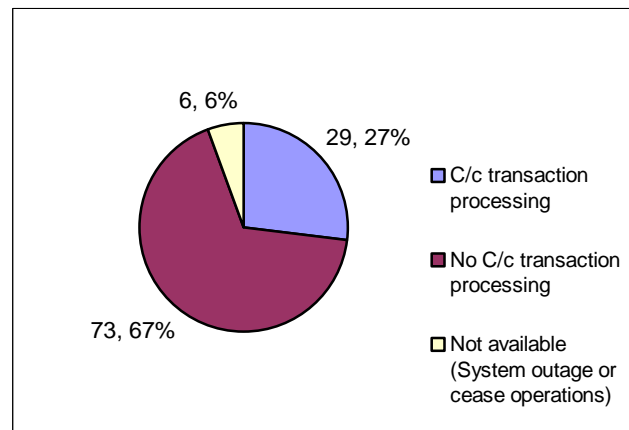
#### 7.2.2.4 Place transformation

Online ordering of products or services using HTML forms was supported by the majority of firms in the sample (see Figure 7.20).



**Figure 7.20 Online Ordering (n, %)**

However, many sites supporting online ordering used solutions that depended upon email client configuration, a usability problem. Usability issues in the implementation of online ordering and fulfilment are discussed in section 7.3. Online fulfilment was less common in the sample than online ordering and found in only 29 firms (26.852%) (see Figure 7.21).



**Figure 7.21 Online Fulfilment (n, %)**

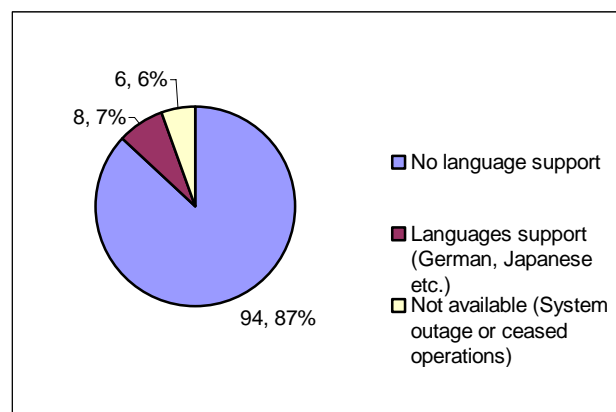
Thus, only slightly more than one quarter of firms afford customers the convenience of online fulfilment.



#### 7.2.2.5 Customer relationships transformation

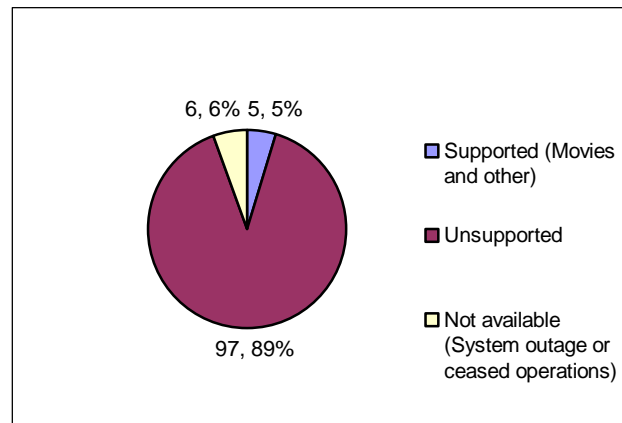
The Dutta and Segev (2001) model augments the Four Ps of the *Marketspace* with customer relations. The Cyber transformation scale employed in this study and described in *Chapter Four*, operationalizes customer relations around sub-clusters of items corresponding to the constructs of *personalization*, *community* and *trust*. This section reports results for these sub-clusters.

Personalization was operationalized in terms of language support and bandwidth sensitive views. Support for foreign languages was uncommon in the sample with ninety four firms (87.037%) involving no such support and eight (7.407%) providing support for at least one foreign language (see Figure 7.22):



**Figure 7.22 Personalization: Language Support (n, %)**

Similarly, bandwidth sensitive views enabling users with slow connections to mitigate download delays (a Usability issue) were also uncommon (see Figure 7.23).

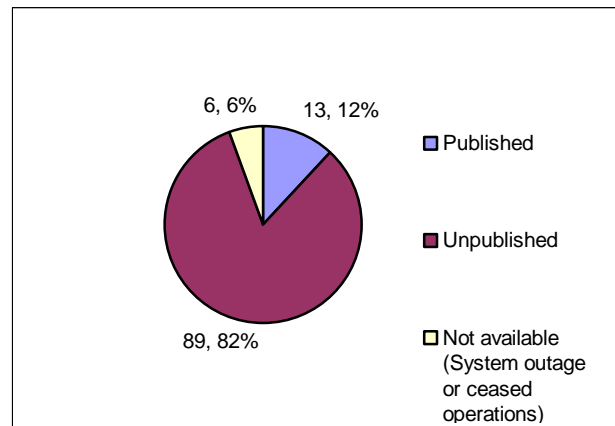


**Figure 7.23 Personalization: Bandwidth (n, %)**

Trust is considered an important determinant of consumer behaviour online (Hoffman, Novak and Peralta, 1999; Jones, S., Morris, P., Masera, M. and Wilikens, P., 2000; Wilikens, M., Vahrenwald, A., and Morris, P., 2000). Within the sample, performance of firms on trust was weak in relation to three critical measures: namely, secure transactions, privacy policy and environmental impacts.

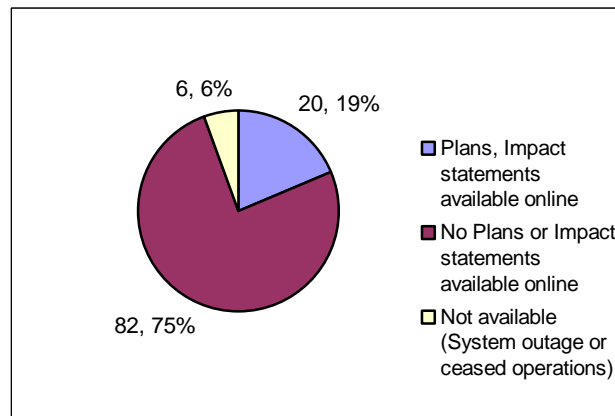
Of the 29 firms offering fulfilment (credit transaction processing), 18 (62.069%) offer this facility outside a secure transaction (SSL encrypted) environment, exposing consumers to risk. Only 11 (37.931%) firms demonstrated SSL capability.

The publication of privacy policy describing third party use of data gathered by the content host was found on 13 sites, a mere 12.037% of sites inspected. Eighty nine sites (82.407%) had no such policy. (see Figure 7.24).



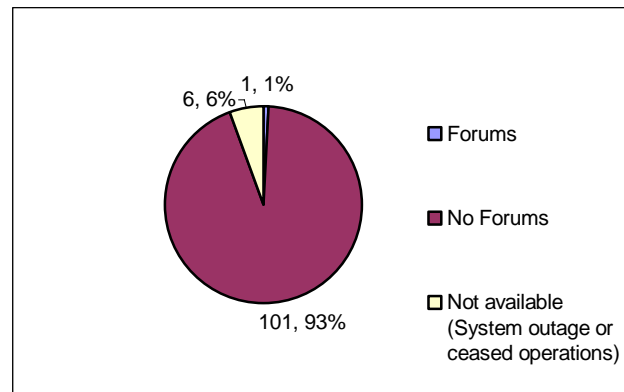
**Figure 7.24 Trust: Online privacy policy**

Environment impact management plans, ecological footprints and other statements that enable consumers to be assured of the ecological credentials of providers are also uncommon (see Figure 7.25). Twenty firms (18.519%) incorporated such statements on their web sites and eighty two (75.925%) provide no such assurance.



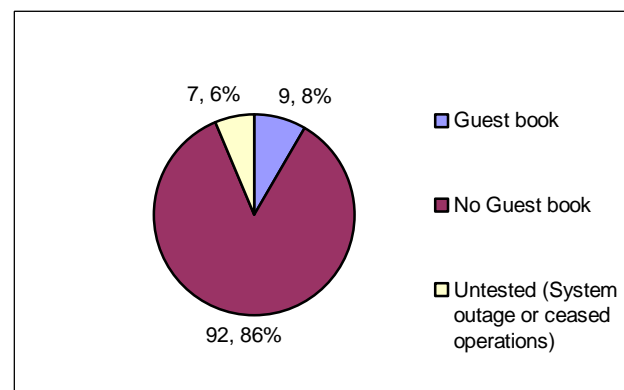
**Figure 7.25 Trust: Environment Impact Management Plans (n, %)**

The role of community in E-commerce also seems unappreciated. Only one firm in the sample employed forums as a component of customer relations strategy (see Figure 7.26).



**Figure 7.26 Customer relations transformation: Forums (n, %)**

Guest books, another component of community strategy and a basis for online equivalent of word-of-mouth promotion, were found on only 9 sites (8.333%) in the sample (see Figure 7.27).

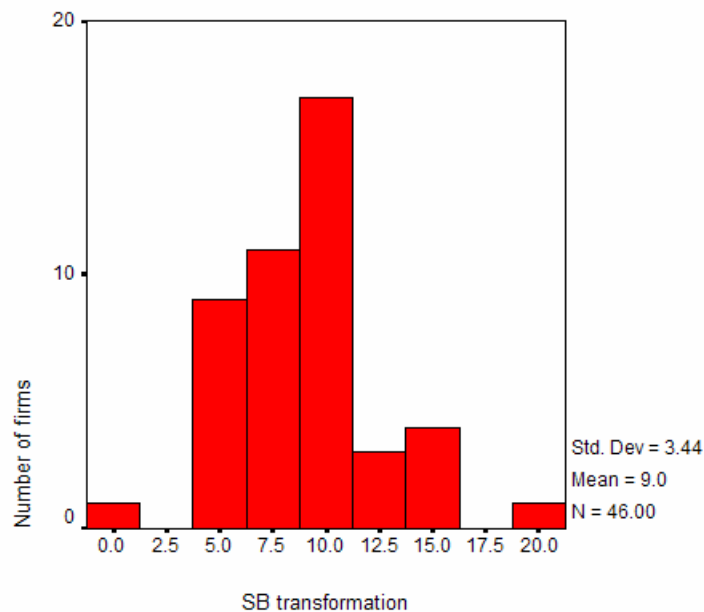


**Figure 7.27 Guest books (n, %)**

Findings on community are grossly inferior to findings in a similar study of the Italian tourism industry conducted by Corigliano and Baggio (2003) which reported 20% of sites with forum functionality.

#### 7.2.2.6 Summary statistics: Strategic Business (SB) Dimension

An overall SB score was calculated from cluster scores (Product, Promotion, Price, Place and Customer relations).<sup>120</sup> The SB score exists on a scale with range 1.000-30.000. Figure 7.28 describes in histogram form the distribution of SB dimension scores for firms with one or more E-commerce value creation measures. The distribution is slightly asymmetric, displays positive skewness and is bunched around a mean of 9.040 on the 30.000 point scale. The median (9.000) and Std. Dev. (3.438) describe strong central tendency in the data around the inferior mean. Around 70.5% of firms are performing within one Std. Dev. of the mean ( $\bar{x} - s, \bar{x} + s$ ).



**Figure 7.28 Frequency Histogram: Strategic Business Transformation**

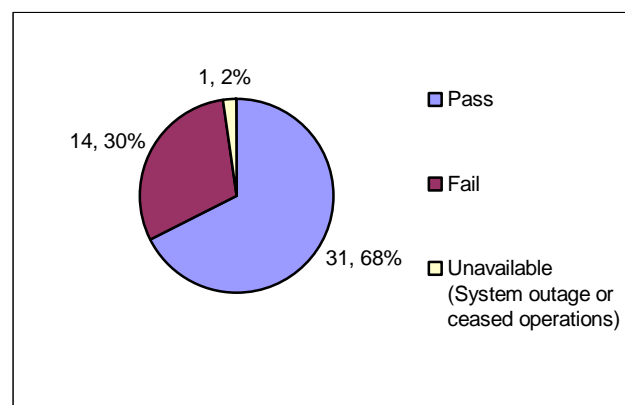
<sup>120</sup> Vide Section 7.2, p.222.

### 7.2.3 Usability

The Usability dimension was not a feature of the original *Marketspace* model and postulated as necessary for domain validity of the model in the light of recent research.<sup>121</sup> Nine items were selected to measure site usability. These items are grounded in the work of Nielsen (1994b), Palmer (2002), McKenzie (2000), Corry *et al.* (1997), Gullikson *et al.* (1999), Shneiderman, (1998) and Rosenfeld (1997).<sup>122</sup> Procedures for instrument design and measurement are described in sections 5.4.1 and 5.4.2. This section reports findings from the Usability investigation.

#### 7.2.3.1 User Mental Map

Figure 7.29 describes Pass/Fail outcomes from application of the User Mental Map test to the 46 E-commerce web sites ( $s=108$ ,  $r=46$ ) for which one or more measures of E-commerce value creation was obtained by survey.



**Figure 7.29 Usability: User Mental Map (n, %)**

Thus, fourteen of the forty six sites (30.435%) that participated in the E-commerce value creation survey failed the user mental map test. Sites that

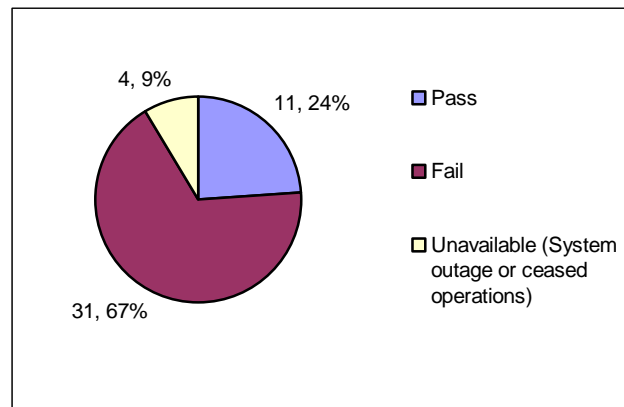
<sup>121</sup> Vide Section 2.3.4.2, p.69.

<sup>122</sup> Vide Section 3.2, p.96.

failed the user mental map test relied upon recall, rather than recognition, for user determination of the user's whereabouts in the system (Nielsen, 1994b; McKenzie, 2000; Crystal and Kalyanaramanu, 2004)) or failed to provide users with feedback on running processes (for example, Shockwave Flash download)(Nielsen, 1994b). Bivariate outcomes from association testing with E-commerce value creation outcomes are described in section 7.3.8.

#### 7.2.3.2 Download optimization

Figure 7.30 shows the results of download optimization testing using Mahadevan, Braun and Chaczko's (2002) so-called "basic 8-second rule."<sup>123</sup> Optimization tests were performed on the 46 E-commerce web sites (s=108, r=46) for which one or more measures of E-commerce value creation was obtained by survey.<sup>124</sup>



**Figure 7.30 Usability: Download optimization (n, %)**

More than two third of the sites (31, 67.391%) failed the test. The maximum download delay measured under optimal conditions was 143 seconds and the

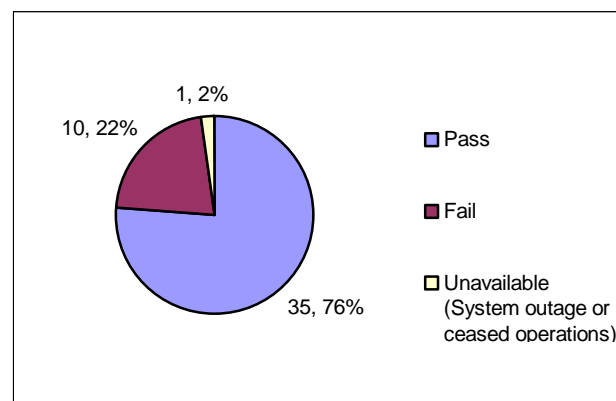
<sup>123</sup> Vide Section 3.2, p.98 for a discussion of Mahadevan, Braun and Chaczko's (2002) so-called "basic 8-second rule".

<sup>124</sup> The method used and rationale for the standard applied are described in section 4.3.1.

minimum was 5 seconds. The median delay was 12 seconds. Since testing assumed optimal operation of a 56Kbps hypothetical circuit, dial up Internet users could be expected to experience delays in excess of those reported due to factors such as network congestion during peak periods. Results are reported in section 7.3.8 for association testing between download delay and each of the three measures of E-value creation adopted for the study.

#### 7.2.3.3 Logical Information Architecture

McKenzie (2000), Rosenfeld and Morville (1998; 2002) and Gullikson *et al.* (1999) developed a notion of information architecture and its importance in Usability testing.<sup>125</sup> Results from application of the logical information architecture test are shown in Figure 7.31.



**Figure 7.31 Usability: Logical information architecture (n, %)**

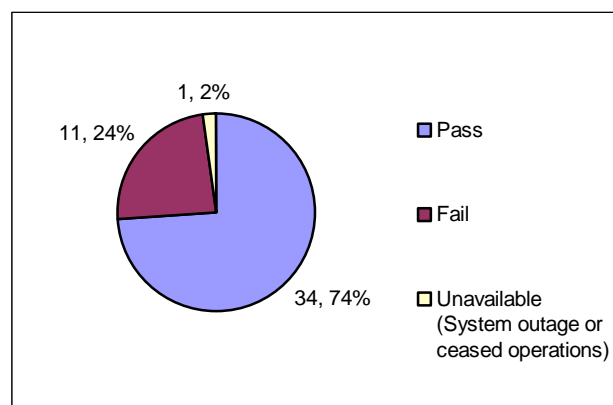
Seventy six percent of sites display logical information architecture. Of the 21.739% that failed the test, non-intuitive link labels comprised a common cause of failure.

<sup>125</sup> Vide Section 3.2, p. 99.



#### 7.2.3.4 Consistent Interface

A non-standardized interface creates an ambiguous mental model in the mind of the user resulting in less effective interaction and user frustration (Nielsen, 1994a; Tullis, 1988; Shneiderman and Plaisant, 2004; and Niemala and Saariluoma, 2003).<sup>126</sup> Figure 7.32 describes the results from interface testing. A consistent user interface could be attributed to thirty four sites comprising 73.913% of sites inspected.



**Figure 7.32 Usability: Consistent Interface (n, %)**

#### 7.2.3.5 Efficient Navigation

Eighteen firms (39.130%) firms responding to the E-commerce value creation survey failed the efficient navigation test (Palmer, 2002). Twenty seven firms (58.695%) passed the test.

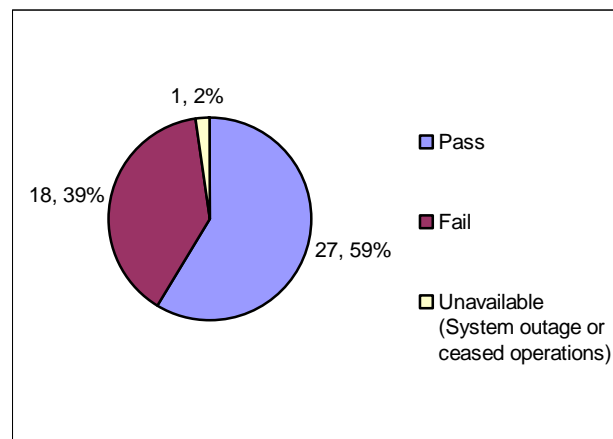
Issues encountered included:

- non-functioning links; and

<sup>126</sup> Vide Section 3.2, p. 100 for a discussion of the literature.

- link menu implementation (basic violations of good interface design practice including bad menu placement, exclusive use of icons without [ALT] text and non-standardized menus).

Figure 7.33 describes findings from the efficient navigation test.<sup>127</sup>



**Figure 7.33 Usability: Efficient Navigation (n, %)**

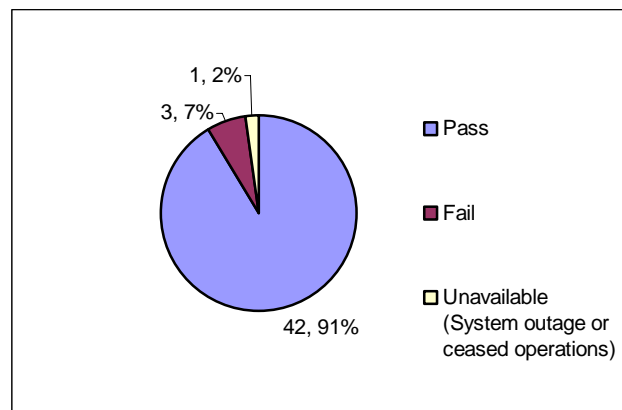
Link menu implementation issues, rather than non-functioning links, predominated as a source of failure.

#### 7.2.3.6 User Control

Developers can remove user control and restrict user freedom by disabling native browser functions.<sup>128</sup> Figure 7.34 reports the results of administration of the user control test across firms that contributed one or more measures of E-commerce value creation:

<sup>127</sup> Vide Section 3.2, p.100 for a discussion of the literature.

<sup>128</sup> Vide Section 3.2, p.101 for a discussion of the literature.

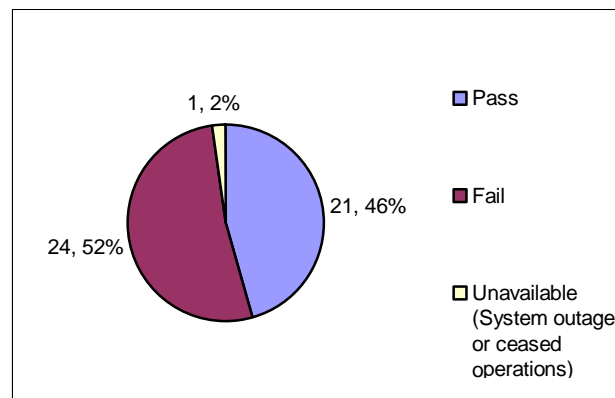


**Figure 7.34 Usability: User control (n, %)**

Forty two sites (91.304%) passed the user control test. The results are consistent with low levels of interactive multimedia technology adoption and simple site designs that pose few user control issues. Denial of user control is not a usability issue manifest in the sample. The low incidence of user control violation precluded inference testing.

#### *7.2.3.7 Operational functionality*

Performance against site operational functionality criteria was good with only two (4.347%) of the forty six sites displaying severe issues. However, non-fatal errors were much more common. Figure 7.35 depicts outcomes from operational functionality testing for non-fatal errors. Of the firms tested, 21 (45.652%) displayed non-fatal operational functionality issues.



**Figure 7.35 Usability: Operational functionality (Non-fatal errors) (n, %)**

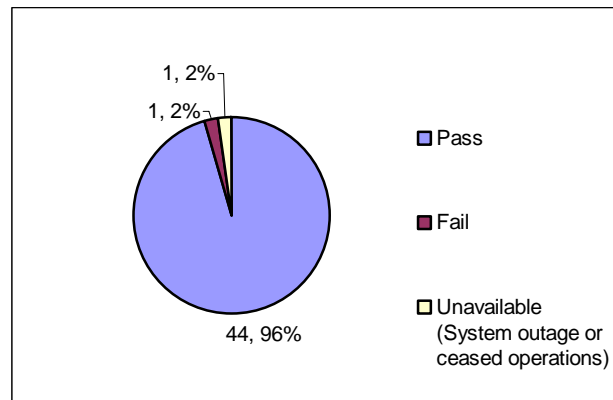
The most common source of recoverable error arose from a design issue, namely, reliance upon the HTML/XHTML mail to function for user (client) feedback. In Internet Explorer, default settings for mail handling result in the launch of Microsoft Outlook each time a *mailto* link is clicked by a user (for example to request further information from the site owner). If Microsoft Outlook is not the installed email package, or has not been configured to work in a WAN mode, user interaction with a *mailto* link can result in an error. For this reason, good site design practice emphasizes the importance of server script enabled forms based email. Other non-fatal sources of error included poor or no implementation of forms validation and navigation links that when tested were found to produce HTTP 404 errors. Source code induced fatal errors were found in two cases of shopping cart implementation.

#### 7.2.3.8 Standard use of the technology

In Chapter *Three*, it was argued that interfaces should work on the basis of recognition, rather than recall and, consequently, that technology should be used predictably in interface design.<sup>129</sup> The inspection method was applied to

<sup>129</sup> Vide Section 3.2, p.100 for a discussion of the literature.

the sample to determine instances of non standard use of the technology that made recovery difficult or impossible. Figure 7.36 describes outcomes from testing:



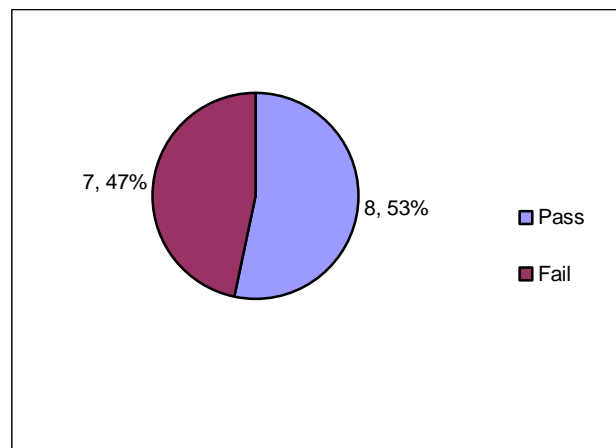
**Figure 7.36 Usability: Standard use of the technology**

Only one of the sites tested failed the standard use of technology test. The result is consistent with other data gathered showing the low technology character of sites in the sample, low levels of interactivity and low establishment budgets. Ninety six percent of the sites rely upon HTML and involve no departures from standard use of the technology. Standard use of the technology is not an issue in the sample.

#### 7.2.3.9 Efficient E-commerce transactions

Firms that responded to the E-commerce value creation survey and operated web sites incorporating online fulfilment were subjected to an E-commerce transactions efficiency test.<sup>130</sup> Figure 7.37 describes results from application of the test.

<sup>130</sup> Vide section 3.2, p. 102 for a discussion of the literature.



**Figure 7.37 Usability: Efficient E-commerce transactions (n, %)**

Of the fifteen sites with fulfilment functionality that participated in the survey, almost half failed the efficiency test. The most common explanation of failure was an insecure transaction environment (McKnight *et al.* 2002; Suh 2003). Two sites failed the test because of issues with shopping cart design (Treese and Stewart, 2003) and implementation involving denial of user control and incorporation of E-commerce transaction in a popUp that could be suppressed by client browser settings.

#### *7.2.4 Summary: Cyber transformation by dimension and cluster*

Table 7.7 summarizes principal findings on Cyber transformation in the sample, organized by clusters and dimensions of the *Marketspace Model*. The inferior outcomes recorded by firms in the sample are consistent with findings from other similar studies. Dimension and cluster outcomes suggest aggregate findings that are reported in the next section.

Table 7.7 Cluster description of Cyber transformation in the sample		
Cluster	Dim.	Findings
Architecture and Internet technologies	TC	<p>Low instance of backend integration (only 9.259% of sites in the sample employ scripted DBMS).<sup>131</sup></p> <p>Low incidence of architecture and technology features providing for user personalization, participation and customization (31.481% of sites do not employ HTML forms to gather client data).<sup>132</sup></p>
Interaction and Simulation	TC	<p>High incidence of static sites with no dynamic features (26.851% of sites consist of static HTML with no dynamic features).<sup>133</sup></p> <p>Low incidence of simulation and interactive technologies (only 5.556% of sites in the sample use simulation with (QTVR/Flash).<sup>134</sup></p> <p>Low incidence of multimedia content encompassing downloadable video (only 12.963% of sites support this feature).<sup>135</sup></p>
Promotion transformation	SB	<p>High incidence of firms that do not employ alliance advertising (53.333%).</p> <p>Only 37.037% of firms pay for advertising on the Web.<sup>136</sup></p>
Place Transformation	SB	<p>Online ordering using a forms interface is available for 53.704% of the product on offer.</p> <p>However online fulfilment is available on only 26.852% of the sites inspected.<sup>137</sup></p>

<sup>131</sup> Vide Section 7.2.1.3, p.225.

<sup>132</sup> *Ibid.*

<sup>133</sup> *Ibid.*

<sup>134</sup> Vide Section 7.2.1.4, p.227.

<sup>135</sup> Vide Section 7.2.1.4, p.226.

<sup>136</sup> Vide Section 7.2.2.2, p.230.

<sup>137</sup> Vide Section 7.2.2.4, p.233.

Customer Relationships: Personalization	SB	Language support is available on only 7.402% of sites inspected.  Bandwidth personalization is supported by 4.603% of sites inspected. <sup>138</sup>
Customer Relationships: Trust	SB	Of 29 firms offering fulfilment, 18 (62.069%) do so outside a secure transaction environment placing confidential customer data at risk.  Publication of privacy policy online is uncommon and observable in only 12.037% of firms examined. <sup>139</sup>

**Legend:** TC= Technological Capability Dimension, SB= Strategic Business Dimension.

### 7.3 Hypotheses testing and Inferential Analysis

This section reports outcomes from hypothesis testing. Quantitative data analysis was performed in Microsoft Excel 2003 and the Statistical Software Package for the Social Sciences (SPSS version 12.0 for Windows).

#### 7.3.1 Cyber Transformation achieved in the sample ( $H_1$ )

In *Chapter Three*, it was hypothesized that low level Cyber transformation outcomes would characterize the sample.

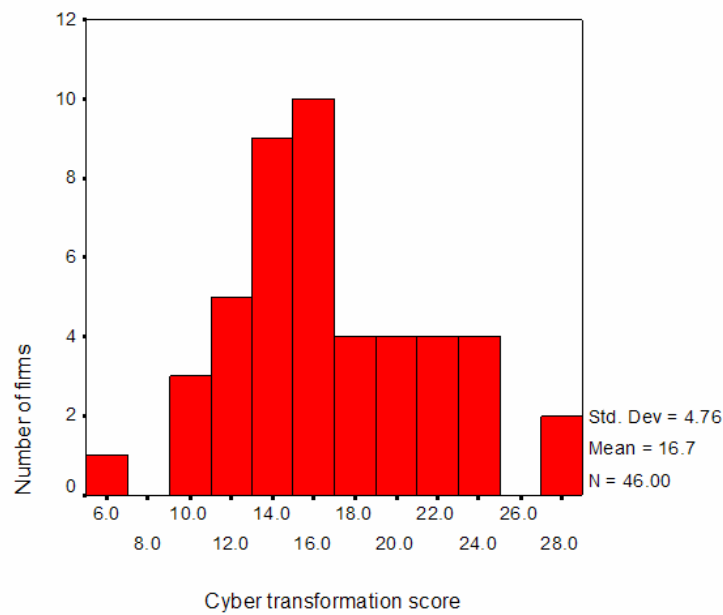
$H_1$ : Cyber transformation is low.
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Figure 7.38 depicts Cyber transformation (CT) outcomes for firms in the sample for which one or more measures of E-commerce value creation was obtained.

<sup>138</sup> Vide Section 7.2.2.5, pp. 234-235.

<sup>139</sup> *Ibid.*





**Figure 7.38 Frequency histogram of Cyber transformation**

The histogram and summary statistics describe a moderately positively skewed distribution (0.458) with strong clustering of firms around a mean (16.697) located well beneath the mid-point of the 53 point scale. Standard deviation (4.762), minimum (6.521) and maximum (28.258) also provide an insight into the inferior outcomes achieved by most firms. Dispersion is minimal and the maximum score achieved is only slightly better than the scale mid-point. Investigation of cumulative frequencies shows that 95.7% of firms have scores beneath the scale mid-point.

The data show that small CT values are typical. A one sample t-test enables rejection of the hypothesis that the mean CT score is equal to the mid range score of 27.000 ( $p=0.000$ ) and the null hypothesis is therefore rejected in favour of  $H_1$ . The descriptive statistics are consistent with the analysis performed in sections 7.1 and 7.2 showing low levels of conformity with many items included in the Cyber transformation scale.

Factors identified in this study at work in promoting inferior outcomes include:

- a low incidence of E-strategy adoption;<sup>140</sup> and
- under investment in E-commerce as measured by Establishment budgets.<sup>141</sup>

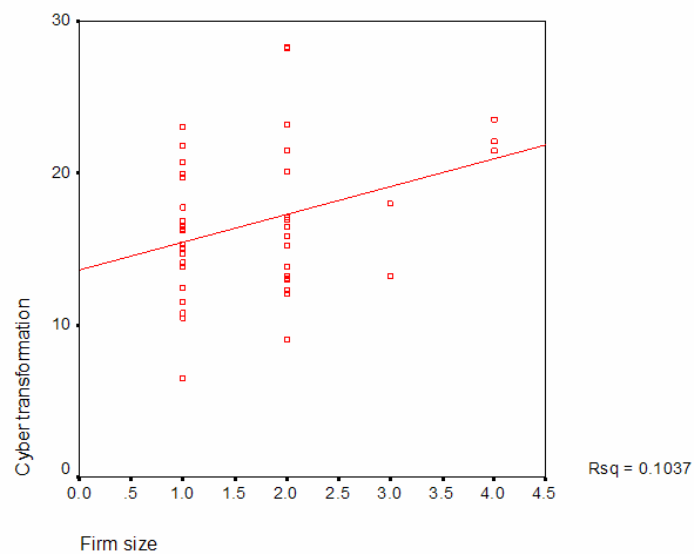
*Chapter Nine* explores in detail the nature and significance of findings on Cyber transformation manifest in the sample.

### 7.3.2 Cyber transformation and firm size ( $H_2$ )

The second hypothesis adopted for the study concerned firm size and turnover.

$H_2$ : Cyber transformation achieved is positively related to firm size and turnover.

Figure 7.39 and 7.40 provide scatter-plot views of the data for the two independent variables.

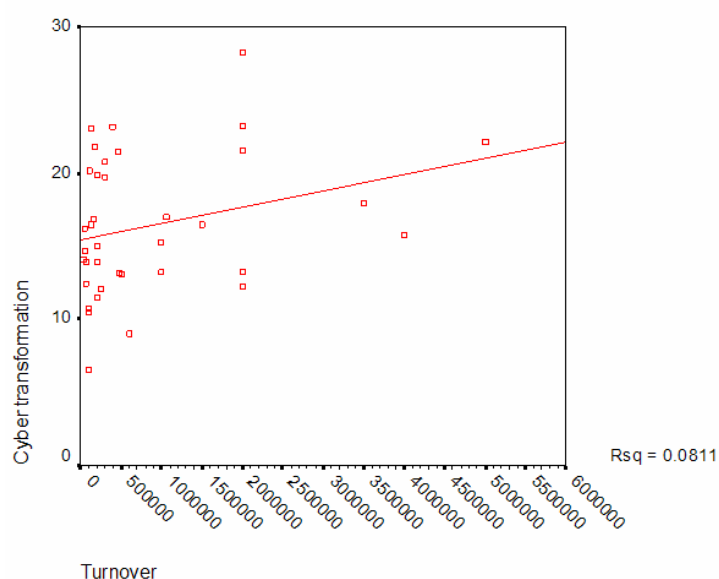


**Figure 7.39 Scatter plot of Firm size v. Cyber transformation**

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<sup>140</sup> Vide Section 7.1.8, p.221.

<sup>141</sup> Vide section 7.1.6, p.218.



**Figure 7.40 Turnover (\$) v. Cyber transformation**

The plots suggest weak positive association between firm size, turnover and Cyber transformation.

Table 7.8 reports the results from 1-tailed testing with Spearman's Rho.

Table 7.8 Cyber transformation, firm size and turnover			
Metric	n	rho	<i>p</i>
Firm size	46	0.271	0.034
Turnover	37	0.299	0.036

Thus, analysis reveals significant positive association between:

- firm size and Cyber transformation in the sample ( $n=46$ ,  $\rho=0.271$ ,  $p = 0.034$ ); and
- firm turnover and Cyber transformation in the sample ( $n=37$ ,  $\rho=0.299$ ,  $p = 0.036$ ).

The results are sufficient to reject the null hypothesis in the case of H<sub>2</sub>. Firm size and turnover are significantly positively associated with Cyber transformation achieved online. However, the strength of this association as described by the correlation coefficient,  $\rho$ , is weak. Is there any more reliable predictor of Cyber transformation outcomes?

The test was expanded to encompass Establishment budgets. Forty four survey respondents described their establishment budgets. It was found that a *highly* significant positive association at  $\alpha=0.01$  exists with Cyber transformation outcomes. The association as conveyed by the correlation coefficient is also stronger ( $n=44$ ,  $\rho=0.443$ ,  $p=0.001$ ). However, the correlation coefficient describes only *moderate* association. In circumstances of market optimality in the provision of E-commerce Web site development services, *strong* association as measured by  $\rho$  would be expected. A crosstabulation was performed based on the groupings of *below median* and *at-or-above* median Cyber transformation outcomes. Table 7.9 describes the results:

Table 7.9 Crosstabulation: Cyber transformation and E-commerce budgets			
E-commerce budgets	Cyber transformation		
	Below median	Above median	Total
<\$5K	16	5	21
\$5K-\$15K	7	12	19
\$15K-\$25K	0	2	2
\$25K-\$50K	0	2	2
Total	23	21	44

Firms with Establishment budgets in the range \$5K-\$15K are more likely to achieve at-or-above median Cyber transformation outcomes than firms spending less, and, no firm spending above \$15K achieved a below median outcome. Thus while the data do not describe optimality in the provision of E-commerce web site design and implementation for SMTEs, they are

encouraging in terms of Cyber transformation and do not support a conclusion of market failure.

### 7.3.3 Cyber Transformation and E-commerce value creation ( $H_3$ )

*Chapters One and Two* comprehensively described Cyber transformation theory and its place in the literature on E-commerce adoption. Its authors, Soumitra Dutta and Ariel Segev, held that that business models and processes must be *transformed* for Cyberspace, if firms are to adopt E-commerce successfully. This transformation must be two-dimensional involving a:

- *Technological Capability (TC)* dimension based on Interactivity and Connectivity; and
- *Strategic Business (SB)* dimension constructed around the factors of Products, Prices, Promotion and Placement (recognizable as the Four Ps of the traditional market model) and customer relations.

The dimensional character of the required transformation is captured in Dutta and Segev's so-called *Marketspace Model*,<sup>142</sup> a description of the business decision domain for Cyberspace (Dutta and Segev, 2001, p.6).

Association between Cyber transformation and E-commerce value creation has been described as a focal relationship for the purposes of this study. It has been argued that the validity of Cyber transformation theory and the *Marketspace Model* rests upon demonstrated association between Cyber transformation outcomes and E-commerce value creation outcomes. No usable data was obtained from respondents on Return on Investment (ROI). Thus, the following hypothesis set formed the basis of testing for association between Cyber transformation and E-value creation:

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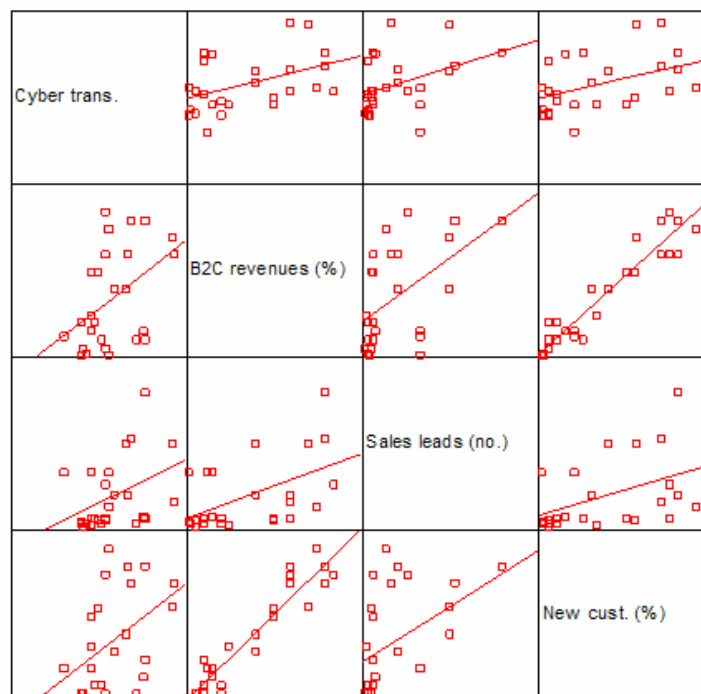
<sup>142</sup> Vide Figure 1.2, p.9.

H<sub>3.2</sub>: Percentage of revenues earned online is positively related to Cyber transformation outcomes;

H<sub>3.3</sub>: The number of sales leads generated by online is positively related to Cyber transformation outcomes; and

H<sub>3.4</sub>: The percentage of new customers acquired online is positively related to Cyber transformation outcomes.

Figure 7.41 comprises a matrix plot describing association between Cyber transformation outcomes and each of the three E-commerce value creation measures.



**Figure 7.41 Matrix plot of Cyber transformation v. E-commerce value creation**

The plot is consistent with predictions based on cluster analysis, which suggest weak positive association between Cyber transformation and each of the three measures of E-commerce value creation. Histograms, box plots and normal probability plots all showed asymmetric distribution across the measures. Of the 46 responding firms that supplied data for the surveyed

financial year 2002-2003, 42 provided data on B2C revenues as a percentage of total revenues, 32 provided data on monthly sales leads and 36 provided data on new customers acquired online as a percentage of total new customers acquired. A non-parametric 1-tailed Spearman's Rho test was applied to sample data. Table 7.10 shows the results from association testing:

Table 7.10 Cyber transformation and E-commerce value Creation (H <sub>3.2-3.4</sub> )			
Metric	n	rho	<i>p</i>
B2C revenues (H <sub>3.2</sub> )	42	0.278	0.037
Sales leads(H <sub>3.3</sub> )	32	0.496	0.002
New customers(H <sub>3.4</sub> )	36	0.215	0.103

Thus, it is concluded that at the  $\alpha = 0.05$  significance level:

- a significant, but *weak* positive association exists between Cyber transformation outcomes and B2C revenues (n=42, rho=0.278,  $p = 0.037$ );
- a *highly* significant, *moderate* positive association exists between Cyber transformation and sales leads (n=32, rho=0.496,  $p = 0.002$ ); and
- *no* significant positive association exists between Cyber transformation and new customers acquired online (n=36, rho=0.215  $p = 0.103$ ).

The evidence is sufficient to reject the null hypothesis for two of the three hypotheses forming the set H<sub>3.2</sub>-H<sub>3.4</sub>. Cyber transformation outcomes are significantly *positively* related to E-commerce value creation outcomes inclusive of B2C revenues (H<sub>3.2</sub>) and sales leads (H<sub>3.3</sub>). This is an encouraging result for Cyber transformation theory, however, no strong association as measured by *rho* is evident the data. Interpretations consistent with the result include the possibility that the observed effect is:

- *weakened* by the operation of other control variables such as Usability;
- mainly attributable to a *subset* of factors within the model forming a single dimension, or a subset of factors within a dimension.

Hypotheses H<sub>6</sub>-H<sub>22</sub> were designed to illuminate factor and other antecedent/control variable contributions. Thus, further hypothesis testing was required to enable a better appreciation of the nature and importance of Cyber transformation theory.

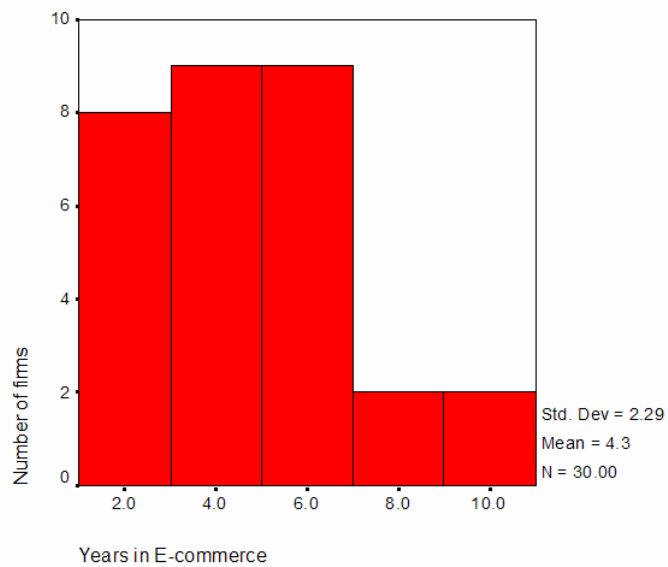
#### 7.3.4 Early Adopter Advantage (H<sub>4</sub>)

H<sub>4</sub> was constructed to test the proposition that early adopters enjoy greater success in terms of E-commerce value creation.

H<sub>4.1-4.4</sub>: Firms enjoying early adopter advantage achieve superior Return on Investment (H<sub>4.1</sub>), Revenue (H<sub>4.2</sub>), Sales leads (H<sub>4.3</sub>) and New Customer (H<sub>4.4</sub>) E-commerce value creation outcomes.

The frequency histogram (see Figure 6.58) and frequency table show that more than one quarter of firms responding (n=30) (26.666%) have been involved in online business for 2 years or less. The mean number of years is 4.3 and the median is 4. The maximum number of years reported was 10 and the minimum was 1.





**Figure 7.42 Frequency histogram: Years in E-commerce**

Table 7.11 describes the results of 1-tailed testing with Spearman's Rho.

Table 7.11 E-commerce value creations and years in E-commerce			
	Spearman's Rho ( $H_4$ )		
Metric	n, rho		$p$
B2C Revenues	28	0.081	0.340
Sales leads	23	-0.166	0.701
New Customers	26	0.000	0.500

The results do not allow rejection of the null hypothesis. We conclude that there is no significant positive association between years in E-commerce and E-commerce value creation outcomes.

The result lends support to the idea of the Web as a democratic, open space for doing business, where new entrants can wrest competitive advantage from incumbents. How do new entrants secure such advantage? As far as this

research is concerned, the case for strategy is a strong one.<sup>143</sup> Firms that pursue E-strategy, are more likely to secure better B2C revenue outcomes. The finding that the number of years a firm has practised E-commerce has no significant association with E-commerce value creation outcomes is entirely consistent with this outcome.

The notion of early adopter advantage as a CSF, may have been relevant when E-commerce on the Web was new in the 1990s, but in 2004 the case for relevance is difficult to establish. As a CSF, this research suggests that early adopter advantage in this population has had its day.

#### *7.3.5 Establishment budgets and E-commerce value creation (H<sub>5</sub>)*

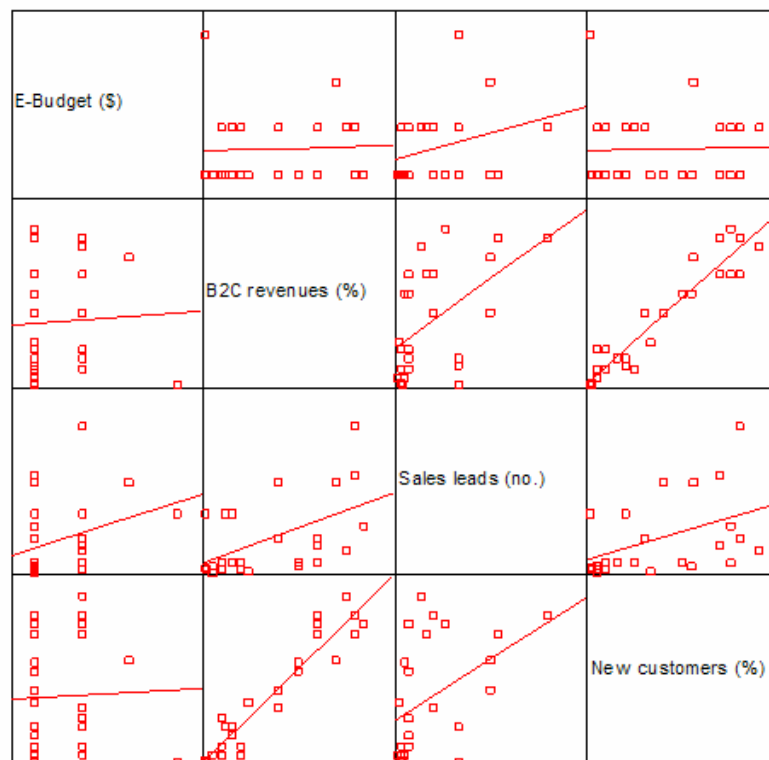
Are establishment budgets associated with E-commerce value creation outcomes? The following hypothesis set describes such a relationship:

H<sub>5.1-5.4</sub>: Return on Investment (H<sub>5.1</sub>), Revenue (H<sub>5.2</sub>), Sales leads (H<sub>5.3</sub>), and New Customer (H<sub>5.4</sub>) are positively related to E-commerce budgets.

Figure 7.43 comprises a scatter plot of Establishment budgets versus E-commerce value creation:

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<sup>143</sup> Vide Sections 7.3.9, p.286 and 7.3.12, p.295.



**Figure 7.43 Matrix plot: Establishment budgets v. E-value creation**

The plots suggest:

- no significant positive association between Establishment budgets and B2C revenues or new customers; and
- a weak positive association between Establishment budgets and sales leads.

A 1-tailed Spearman's Rho test for positive association was performed on the data. Table 7.12 reports the results of this testing:

Table 7.12 Establishment budgets and E-commerce value creation			
Metric	n	rho	<i>p</i>
B2C revenues (H <sub>5.2</sub> )	40	0.082	0.307
Sales leads (H <sub>5.3</sub> )	32	0.339	0.029
New customers (H <sub>5.4</sub> )	35	0.009	0.480

Thus, confirming interpretation of the scatter plots, correlation testing showed that the null hypothesis ( $H_0: \rho = 0$ ) could not be rejected in the cases of H<sub>5.2</sub> and H<sub>5.4</sub>. However, correlation testing did show that there is a significant positive association between establishment budgets and the new economy metric of sales leads at the  $\alpha = 0.05$  significance ( $n=32$ ,  $\rho=0.339$ ,  $p = 0.029$ ). However, the relationship as measured by *rho* is weak.

Analysis therefore suggests that E-commerce budgets *do not* fundamentally determine E-commerce value creation outcomes. The positive association seen between E-commerce budgets and Cyber transformation achieved does not translate into E-value creation. Results from analysis suggest popular wisdom about E-commerce on the Web, namely, its essentially democratic character, consummately expressed in the idea of the Web as a 'level playing field' where the traditional advantages in commerce that attract to size and resources do not apply. The lesson for E-commerce adopters is clear. No straight forward relationship exists between budget size and E-commerce value creation outcomes achieved online and how E-commerce establishment budgets are allocated may also operate to determine outcomes. The result is also consistent with other forms of advantage such as marketing budgets (De Waal, 2004) operating as independent control variables.

### 7.3.6 TC transformation and E-commerce value ( $H_6$ )-(H<sub>11</sub>)

#### 7.3.6.1 TC Dimension contribution to E-value Creation ( $H_6$ )

A fundamental goal of the research was to measure dimension and cluster contributions to E-value creation. Hypothesis set  $H_6$  was devised to measure the contribution to E-value creation from the Technological Capability dimension:

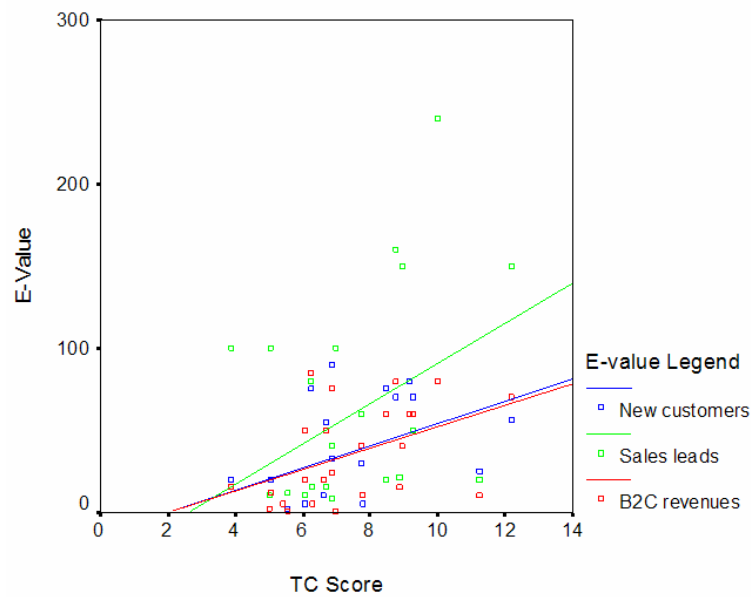
$H_{6.1}$ : Return on Investment in online is positively related to *Technological Capability (Interactivity and connectivity)* transformation outcomes;

$H_{6.2}$ : Percentage of revenues earned online is positively related to *Technological Capability (Interactivity and connectivity)* transformation outcomes;

$H_{6.3}$ : The number of sales leads generated by online is positively related to *Technological Capability (Interactivity and connectivity)* transformation outcomes; and

$H_{6.4}$ : The percentage of new customers acquired online is positively related to *Technological Capability (Interactivity and connectivity)* transformation outcomes.

As discussed in Section 7.1.5.5, insufficient data was obtained to test  $H_{6.1}$ . Figure 7.44 describes a scatter plot of Technological capability versus E-commerce value creation outcomes.



**Figure 7.44 Scatter plot: TC transformation v. E-value creation**

The plot suggests weak association between TC transformation and each of the three E-commerce value creation measures. Table 7.13 describes the results of testing for positive association with 1-tailed Spearman's Rho.

Table 7.13 Technological Capability and E-commerce value creation			
Metric	n	rho	<i>p</i>
B2C Revenues	42	0.159	0.157
Sales Leads	32	0.294	0.051
New Customers	36	0.150	0.192

Thus, at the  $\alpha = 0.05$  significance level, the null hypothesis could not be rejected for  $H_{6.2}$  and  $H_{6.4}$  on the available data. The analysis did, however, show a weak *marginal* positive association at slightly above  $\alpha = 0.05$  between TC scores and sales leads ( $n=32$ ,  $\rho=0.294$ ,  $p = 0.051$ ). This outcome suggests that the role of transformation along the Technological Capability axis is one of attracting customers and connecting them with the vendor. However, it does not significantly determine whether a customer will be acquired and,

thus, whether the proportion of revenues earned online will be increased. The data are not persuasive on the contribution of Technological Capability to E-value creation.

#### 7.3.6.2 TC Cluster contribution to E-value Creation ( $H_7$ )-( $H_{11}$ )

Table 7.14 describes results from 1-tailed Spearman's Rho tests performed on *clusters* making up the TC dimension. At cluster level, score distributions were asymmetric. No significant associations at  $\alpha = 0.05$  with Spearman's Rho were evident in any of the clusters making up the Technological Capability (TC) axis.

Table 7.14 Association testing of TC cluster contribution to E-commerce value creation									
	B2C Revenues			Sales Leads			New Customers		
Cluster	n	rho	<i>p</i>	n	rho	<i>p</i>	n	rho	<i>p</i>
AET	42	0.145	0.180	32	0.216	0.118	36	0.206	0.114
DISC.	42	0.052	0.372	32	0.194	0.143	36	0.096	0.289
ISIM	42	0.086	0.294	32	0.284	0.058	36	0.053	0.380
MM	42	0.096	0.273	32	0.229	0.104	36	0.056	0.373

**Legend:** AET= Architecture & Enabling Technologies, DISC= Discovery, ISIM= Interaction/Simulation, MM= Multimedia/Vividness

At cluster level, these findings did not encourage further investigation. The following hypotheses were therefore rejected in favour of the *null* hypothesis in each case:

$H_{7.1-7.4}$ : Return on Investment ( $H_{7.1}$ ), Revenue ( $H_{7.2}$ ), Sales leads ( $H_{7.3}$ ) and New Customer ( $H_{7.4}$ ) E-commerce value creation outcomes are positively related to site Architecture and Internet enabling technologies;

$H_{8.1-8.4}$ : Return on Investment ( $H_{8.1}$ ), Revenue ( $H_{8.2}$ ), Sales leads ( $H_{8.3}$ ) and New Customer ( $H_{8.4}$ ) E-commerce value creation outcomes are positively related to discovery outcomes;

$H_{9.1-9.4}$ : Return on Investment ( $H_{9.1}$ ), Revenue ( $H_{9.2}$ ), Sales leads ( $H_{9.3}$ ) and New Customer ( $H_{9.4}$ ) E-commerce value creation outcomes are positively related to the use of interactivity and simulation in site design;

H<sub>10.1-10.4</sub>: Return on Investment (H<sub>10.1</sub>), Revenue (H<sub>10.2</sub>), Sales leads (H<sub>10.3</sub>) and New Customer (H<sub>10.4</sub>) E-commerce value creation outcomes are positively related to Multimedia (Vividness).

The contribution of channels to E-commerce value creation was to be tested with the following hypothesis:

H<sub>11.1-11.4</sub>: Return on Investment (H<sub>11.1</sub>), Revenue (H<sub>11.2</sub>), Sales leads (H<sub>11.3</sub>) and New Customer (H<sub>11.4</sub>) E-commerce value creation outcomes are positively related to the use of Internet channels in destination planning, customer relations and product distribution.

However, no firms participating in the study had deployed SMS gateway or other channelling technology, making a finding impossible. The failure of firms to take up technology integration is consistent with the low technology outcomes seen elsewhere in the sample.

#### 7.3.6.3 CSFs in the TC dimension

With no evidence of significant association at the required significance level between TC clusters and E-value creation outcomes, attention turned to possible CSFs that existed within these clusters (such as downloadable video, sound, virtual reality et cetera). Investigation of the data began with *interactivity and multimedia*. In the previous section, bivariate correlational analysis using a 1-tailed test with Spearman's Rho revealed a *marginal* positive association at  $\alpha = 0.05$  between Interaction and Simulation (ISIM) and one of the three measures of E-commerce value creation- online sales leads. This encouraged further investigation of CSFs operating within this cluster.

Testing with 1-tailed Spearman's Rho subsequently revealed significant moderate association ( $n=32$ ,  $\rho=0.369$ ,  $p=0.019$ ) between online sales leads and downloadable video at  $\alpha = 0.05$ . In tourism research, albeit with small numbers, the result therefore shows that the benefits to site operators that



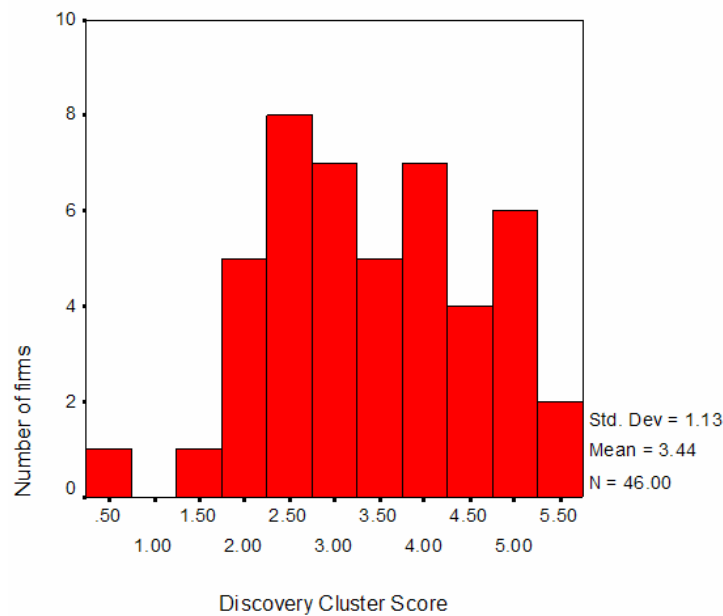
accrue to multimedia extend beyond stickiness (De Waal, 2004; Gretzel and Fesenmaier, 2003) to a demonstrated E-value creation benefit that requires further investigation. But the association is moderate and does not translate into new customers or B2C revenues. Insignificant levels of adoption of simulation technologies excluded meaningful testing for association with E-value creation outcomes and, hence, the research sheds no light on other work suggesting its importance (Rayman-Bacchus and Molina, 2001; Buhalis, 2003).

Discovery was also subjected to CSF investigation. The logic of metrics selected to measure the effectiveness of discovery strategy are comprehensively described in Chapter *Four*. These metrics consist of:

- the portal count (captured as a rank of the data set based on the portal/directory count, with values in the range 0.000 to 1.000);
- metadata tagging (treated dichotomously with values 1, 0 corresponding to the presence or otherwise of meta tagging);
- L2S (unique links to this site from other sites as measured by Google's link site URL search. Captured as a rank of the data set based on the mean value over three months, sampled at the rate of once per month, with values in the range 0.000 to 1.000);
- Links (Unique links to this site from other sites as measured by AlltheWeb link site URL search. Captured as a rank of the data set, with values are in the range 0.000 to 1.000);
- Google's PageRank (Google's PageRank for this site captured as the mean rank over three months, sampled at the rate of once per month, with values are in the range 0.000-1.000); and

- the Alexa traffic rank (Captured on a scale of 0.000-1.000). Values are dichotomous (1,0) for each of the three survey months. Sites that generated a rank received a score of 1, and sites that did not 0. The mean value of the three separate samplings determined the final score. The final score was in the range 0.000-1.000.

Discovery cluster scores recorded by firms in the sample existed in the range 0.000-6.000. The minimum score achieved by a firm was 0.521 and the maximum was 5.483. Figure 7.45 is a frequency histogram of discovery cluster scores for the 46 firms that participated in the *E-commerce Adoption Survey*.



**Figure 7.45 Frequency histogram: Discovery Cluster**

The distribution displays central tendency, with a negative skew and kurtosis describing better than average performance as typical and some strong performers toward the higher end of the scale. The role that metadata displays in discovery, seems to be widely understood with only 3 firms of the 46 that returned E-value creation data displaying no metadata tagging.

Over three samplings, 70 (66.667%) of firms in the sample were successful in attracting a Mean Alexa Traffic Rank of 1, indicating that they had attracted sufficient traffic as measured by the Alexa Toolbar to receive a traffic rank in each of the surveyed months. Only 11 (10.476%) firms attracted no rank in any of the survey samplings. Findings on skewness, metadata and the Alexa Traffic Rank suggest that the role of discovery in E-commerce is understood by firms and that discovery is an area where firms are striving to improve performance. Inter firm rivalry for improved discovery outcomes and the securing of competitive advantage suggests a conclusion from hypothesis testing found in section 7.3.6.2, where testing of  $H_{8.2-8.4}$  showed no significant positive association at the significance level between the discovery cluster scores and any of the three E-value creation metrics adopted for the study. In circumstances of striving and imitation, competitive advantage in discovery is difficult to maintain. However, the static, rather than longitudinal nature of the current study, does not enable a reliable conclusion to be drawn. Metadata certainly does not provide the key and further probing is required to illuminate the contribution of discovery variables.

Of all discovery CSFs examined, the portal count provided the most promising evidence of the role of discovery in E-commerce strategy. The mode (5.000), median (8.500) skewness (2.164) and box plot described an asymmetric, low-end heavy distribution with a handful of outliers and extreme cases (6) performing in a range above 1 Std. Dev. from the mean (12.570). Inspection of frequency histograms for responding firms in the sample showed a superior group of firms that were represented on 20 or more industry relevant portals and had well developed links partnering strategy based on 20 or more unique domain linking URLs. However, further investigation of the descriptive statics describing tourism industry portal links showed that inferior portal count outcomes were typical. Employing a 1-tailed test with Spearman's Rho, *marginal* positive association at slightly

above the  $\alpha = 0.05$  significance level was found between the portal count and new customers acquired online ( $n=36$ ,  $\rho=0.272$ ,  $p=0.054$ ) and the portal count and B2C revenues ( $n=42$ ,  $\rho=0.232$ ,  $p=0.070$ ).

Bivariate testing of metadata, Google links, Google Page Rank, AlltheWeb links, Alexa Traffic Rank did not reveal any further CSFs. Thus, in relation to one of the three E-commerce value creation measures for which data was obtained, the extent to which firms participate in tourism industry portals has been shown to be *marginally* positively associated with E-value creation outcomes achieved.

Such evidence suggests the logic of regional purpose designed Ecotourism portals. However, only two respondents were found to be participating in a regional Ecotourism portal.<sup>144</sup>

#### 7.3.7 SB Transformation and E-commerce value ( $H_{12}$ )-(H<sub>17</sub>)

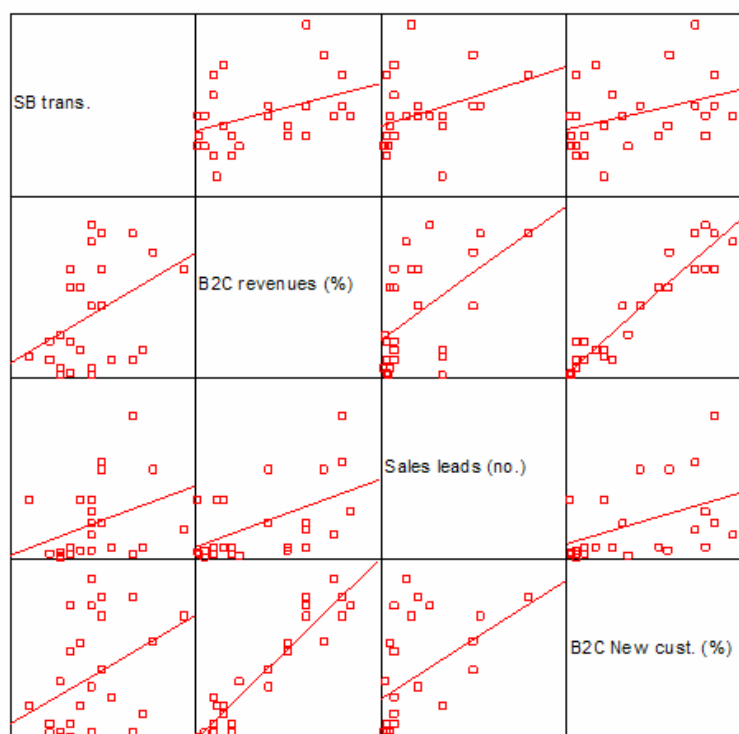
In Chapter *Four*, it was hypothesized that:

- H<sub>12.1</sub>: Return on Investment in online is positively related to *Strategic Business* transformation outcomes;
- H<sub>12.2</sub>: Percentage of revenues earned online is positively related to *Strategic Business* transformation outcomes;
- H<sub>12.3</sub>: The number of sales leads generated by online is positively related to *Strategic Business* transformation outcomes; and
- H<sub>12.4</sub>: The percentage of new customers acquired online is positively related to *Strategic Business* transformation outcomes.

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<sup>144</sup> Community Alliance for Sustainable Tourism. (2004). *Blue Mountains Eco-Tourism Experience*. Retrieved 28 December, 2004 from <http://www.bluemnts.com.au/ecotourism>.

Due to insufficient ROI data, no tests were performed on  $H_{12.1}$ . A matrix scatter plot was used to inspect for evidence of positive association for each of the three remaining measures of E-commerce value creation (see Figure 7.46).



**Figure 7.46 Matrix plot: SB transformation and E-commerce value creation**

The plots suggest positive association between SB transformation and E-commerce value creation. A 1-tailed test with Spearman's Rho was used to determine if the hypothesised positive association was significant. Table 7.15 describes outcomes from testing.

Table 7.15 Correlation testing: SB transformation and E-commerce value creation			
Metric	n	rho	<i>p</i>
B2C Revenues ( $H_{12.2}$ )	42	0.318	0.020
Sales Leads( $H_{12.3}$ )	32	0.516	0.001
New Customers ( $H_{12.4}$ )	36	0.236	0.083

Thus, it is concluded that:

- a significant *moderate* positive association exists between SB transformation and B2C revenues ( $n=42$ ,  $\rho=0.318$ ,  $p=0.020$ ) at the  $\alpha=0.05$  significance level;
- a *highly* significant moderate positive association exists between SB transformation and sales leads ( $n=32$ ,  $\rho=0.516$ ,  $p=0.001$ ) at the  $\alpha=0.01$  significance level; and
- a *marginally* significant positive association exists between SB transformation and new customers ( $n=36$ ,  $\rho=0.236$ ,  $p=0.083$ ) at the  $\alpha=0.1$  significance level.

Thus, two of the three measures have returned results consistent with significant positive association. The result enables rejection of the null hypothesis in the cases of hypotheses  $H_{12.2}$  and  $H_{12.3}$  and is a much stronger result on association than that shown in analysis of TC dimension outcomes.<sup>145</sup> Results include one highly significant association ( $\alpha=0.01$  as opposed to  $\alpha=0.05$ ) and correlation coefficients are larger.

Thus, SB transformation, rather than TC transformation, has been shown to be the strongest contributor to the observed association between Cyber transformation and E-commerce value creation reported in testing of  $H_3$ . The result is a strong finding in favour of SB transformation, but which of the clusters of business transformation are primarily responsible for the association?

Hypothesis sets  $H_{13}$ - $H_{17}$  were devised to test cluster contributions:

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<sup>145</sup> Vide section 6.2.1.7

H<sub>13.1-13.4</sub>: Return on Investment (H<sub>13.1</sub>), Revenue (H<sub>13.2</sub>), Sales leads (H<sub>13.3</sub>) and New Customer (H<sub>13.4</sub>) E-commerce value creation outcomes are positively related to Product transformation.

H<sub>14.1-14.4</sub>: Return on Investment (H<sub>14.1</sub>), Revenue (H<sub>14.2</sub>), Sales leads (H<sub>14.3</sub>) and New Customer (H<sub>14.4</sub>) E-commerce value creation outcomes are positively related to Promotion transformation.

H<sub>15.1-15.4</sub>: Return on Investment (H<sub>15.1</sub>), Revenue (H<sub>15.2</sub>), Sales leads (H<sub>15.3</sub>) and New Customer (H<sub>15.4</sub>) E-commerce value creation outcomes are positively related to Price transformation.

H<sub>16.1-16.4</sub>: Return on Investment (H<sub>16.1</sub>), Revenue (H<sub>16.2</sub>), Sales leads (H<sub>16.3</sub>) and New Customer (H<sub>16.4</sub>) E-commerce value creation outcomes are positively related to Place transformation.

H<sub>17.1-17.4</sub>: Return on Investment (H<sub>17.1</sub>), Revenue (H<sub>17.2</sub>), Sales leads (H<sub>17.3</sub>) and New Customer (H<sub>17.4</sub>) E-commerce value creation outcomes are positively related to Customer relations transformation.

Table 7.16 describes outcomes from 1-tailed Spearman's Rho testing of clusters occurring within the SB dimension.

Table 7.16 Association testing of SB cluster contribution to E-commerce value									
	B2C Revenues			Sales Leads			New Customers <sup>146</sup>		
Cluster	n	rho	p	n	rho	p	n	rho	p
PROD	42	0.194	0.109	32	.	.	36	.	.
PROM	42	0.386	0.006	32	0.523	0.001	36	0.337	0.022
PRICE	42	0.113	0.239	32	0.021	0.454	36	-0.019	0.455
PLACE	42	-0.142	0.185	32	0.050	0.393	36	-0.235	0.084
C/REL	42	0.302	0.026	32	0.335	0.030	36	0.237	0.082

**Legend:** PROD= Product transformation, PROM= Promotion transformation, PRICE= Price transformation, PLACE= Place transformation, C/REL= Customer relations transformation

<sup>146</sup> For sales leads and new customers no variation existed in the data for product transformation, hence no value was calculated by SPSS.

Analysis shows that a significant positive association exists between Promotion transformation and all three E-commerce value creation metrics, sufficient to reject the null hypothesis ( $H_{14.2-14.4}$ ). With B2C revenues ( $n=42$ ,  $\rho=0.386$ ,  $p = 0.006$ ) and sales leads ( $n=32$ ,  $\rho=0.523$ ,  $p = 0.001$ ) association is *highly* significant occurring at the  $\alpha = 0.01$  significance level. The value of the correlation coefficient ( $\rho=0.523$ ) shows moderate association between promotion transformation and sales leads. Positive association with new customers ( $n=36$ ,  $\rho=0.337$ ,  $p = 0.022$ ) exists at the  $\alpha = 0.05$  significance level.

Analysis shows that Customer relations transformation is also significantly positively associated with two of the three E-commerce value creation metrics. The evidence of positive association is sufficient to reject the null hypothesis in the case of  $H_{17.2-17.3}$ . With B2C revenues ( $n=42$ ,  $\rho=0.302$ ,  $p = 0.026$ ) and sales leads ( $n=32$ ,  $\rho=0.335$ ,  $p = 0.030$ ) the association is significant, but moderate. Product, Price and Place transformation do not display significant positive association with any of the three E-value creation metrics at the  $\alpha = 0.05$  significance level. Inspection of Product transformation scores when measured against the scale displayed an extreme lack of variance (Mean= 0.940 Std. Dev.= 0.283; Var.= 0.080). In the Price cluster, scores similarly displayed lack of variance (Mean= 0.790 Std. Dev.= 0.411; Var.= 0.169) with no instances of dynamic price customization or online price negotiation found in the data set. Thus, the evidence does not enable rejection of the null hypothesis in the case of hypothesis sets  $H_{13}$  and  $H_{15-16}$ .

In conclusion, analysis of SB transformation outcomes provides clear evidence of positive association between the *Marketspace* factors of Promotion and Customer relations and E-commerce value creation metrics. Unlike transformation along the TC axis, evidence of positive association extends beyond the new economy metrics of sales leads, to the traditional or hard business metrics of revenues earned and new customers acquired.



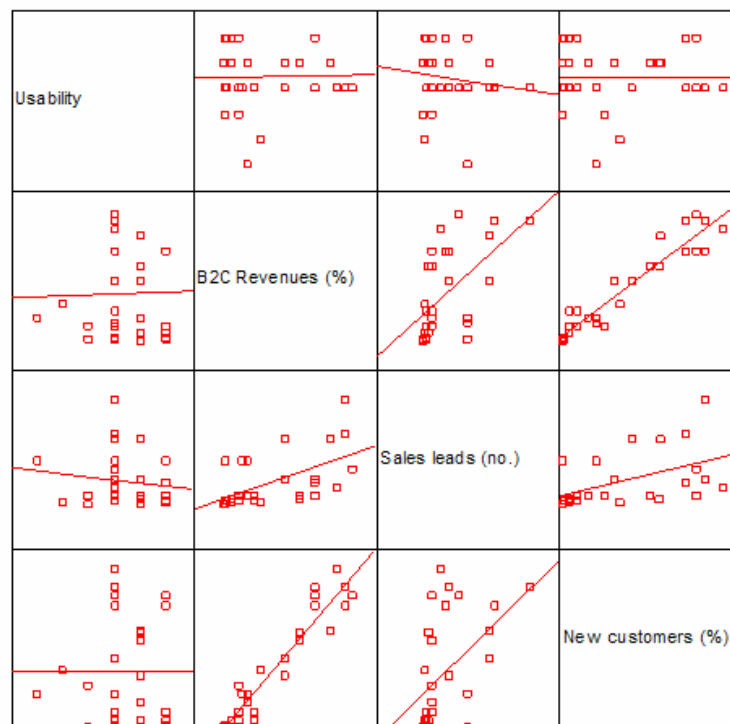
7.3.8 Usability and E-commerce value creation outcomes ( $H_{18}$ ) - ( $H_{19}$ )

In Chapter Four, two sets of hypotheses were proposed concerning Usability:

$H_{18.1-18.4}$ : Return on Investment ( $H_{18.1}$ ), Revenue ( $H_{18.2}$ ), Sales leads ( $H_{18.3}$ ) and New Customer ( $H_{18.4}$ ) E-commerce value creation outcomes are positively related to Usability.

$H_{19.1-19.4}$ : In association with Cyber Transformation, Return on Investment ( $H_{19.1}$ ), Revenue ( $H_{19.2}$ ), Sales leads ( $H_{19.3}$ ) and New Customer ( $H_{19.4}$ ) E-commerce value creation outcomes are related to Usability.

Recall from Chapter Five, that the Usability construct was operationalized with a nine point scale based on nine usability parameters in the population. Figure 7.47 comprises a matrix scatter plot of overall Usability scores for each of the three E-commerce value creation metrics.



**Figure 7.47 Matrix scatter plot of Usability v. E-Commerce value creation**

The scatter plot suggests no significant association between usability outcomes based on the nine point scale and E-commerce value creation. Table

7.17 reports outcomes from application of a 1-tailed Spearman's Rho test for association.

Table 7.17 Usability and E-commerce value creation			
Metric	n	rho	<i>p</i>
B2C revenues	41 <sup>147</sup>	-0.047	0.616
Sales leads	29	-0.130	0.761
New customers	31	-0.128	0.771

Thus, data analysis revealed no significant association between Usability and any of the three E-commerce value creation metrics in the sample at the dimensional level. The study was therefore obliged to return the null hypothesis for the hypothesis set  $H_{18.2-18.4}$ .

The question remained as to whether any items within the Usability dimension comprise CSFs in terms of E-value creation. Table 7.17 shows outcomes from Mann-Whitney U Exact 1-tailed testing<sup>148</sup> for significant differences in E-value creation outcomes between sites that passed and failed the *user mental map* test.

Table 7.18 User mental map and E-commerce value creation			
Metric	n <sub>1</sub>	n <sub>2</sub>	<i>p</i>
B2C revenues	29	12	0.158
Sales leads	22	10	0.920
New customers	27	9	0.565

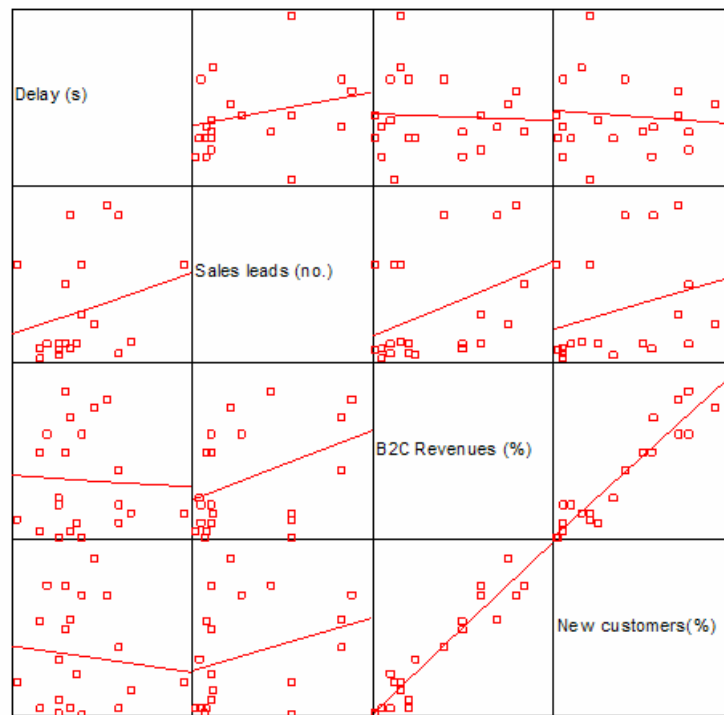
**Legend:** n<sub>1</sub>=Pass, n<sub>2</sub>=Fail

<sup>147</sup> Of the 42 firms that supplied metrics describing E-value creation, one firm relied on travel portals i.e. did not operate its own Web site, hence this firm is not represented in the Usability study.

<sup>148</sup> *Chapter Three* explains the view from the literature that Usability is positively related to E-value creation, hence a 1-tailed test was used.

Thus, analysis revealed no significant differences in E-commerce value creation outcomes between firms that passed the mental map test and those that failed the test. The result should be understood in terms of the shallow nature of sites in the sample. In a computational study of search efficiency Miller and Remington (1999, p.5) found that mental map issues such as link labels, produced significantly different search efficiency outcomes compared with shallower sites. In shallow sites, an inefficient mental map is less likely to result in user confusion and frustration leading to abandonment of the site. Hence, in the sample, failure of the mental map test did not pose severe implications for the usability of surveyed sites.

Would bivariate testing yield a more encouraging result on *latency*? Inspection of the box plot for delay showed three extreme scores (143s, 120s and 69s). These sites were clearly not designed by professionals and retention in the test set clearly posed problems for test reliability. The data set was accordingly reduced to eliminate these cases and additional cases where the presence of Shockwave Flash (.swf) frustrated site download and subsequent measurement in Macromedia Dreamweaver. Figure 7.48 is a matrix box plot describing the relationship between download delay (s) and each of the three E-commerce value creation measures.



**Figure 7.48 Matrix plot: Delay (s) and E-commerce value creation**

The scatter plots suggest negative association between delay and two of the three metrics-B2C revenues and new customers. A 1-tailed Spearman's Rho test was used to determine if the suggested associations were significant. Table 7.19 describes results from testing.

Table 7.19 Download delay and E-commerce value creation			
Metric	n	rho	<i>p</i>
B2C revenues	35	-0.069	0.654
Sales leads	28	0.105	0.297
New customers	30	-0.171	0.827

Thus, analysis showed no significant *negative* association between download delay and any of the three measures of E-commerce value creation adopted for the study. The result contrasts with the popular view of extreme user sensitivity to download delay (Palmer 2002; Nielsen 1994b; Ramsay, Barbesi, and Preece, 1998). Inspection of the stem and leaf plot showed fifteen firms

performing in the range of 12 to 20 seconds, i.e., well outside industry benchmarks and under optimal conditions. In the sample, inferior usability outcomes with download delay are not significantly negatively associated with online sales leads, B2C revenues or new customers acquired. Table 7.19 describes the situation with *logical information architecture*. A Mann-Whitney U independent samples test was applied to the logical information architecture data.

Table 7.20 Logical information architecture and E-commerce value creation			
Metric	n <sub>1</sub>	n <sub>2</sub>	<i>p</i>
B2C revenues	32	9	0.154
Sales leads	25	7	0.083
New customers	30	6	0.058

**Legend:** n<sub>1</sub>=Pass, n<sub>2</sub>=Fail

Thus, testing revealed that firms:

- passing the information architecture test achieved *marginally* significantly different new customer E-commerce value creation outcomes at the significance level from firms that failed the test (n<sub>1</sub>=30, n<sub>2</sub>=6, *p* =0.058); and
- passing the information architecture test did not achieve significantly different B2C revenue (n<sub>1</sub>=32, n<sub>2</sub>=9, *p* =0.154) or sales lead (n<sub>1</sub>=25, n<sub>2</sub>=7, *p* =0.083) outcomes from firms that failed the test.

Encompassing only one of three E-commerce value creation metrics, the result is encouraging, but marginal and, hence, not conclusive on the role of information architecture as a CSF.

Section 7.2.3.4 described how the sample performed well against the *consistent user interface* test with three quarters of sites displaying a consistent interface. This design principle appears to be well understood by site designers. Table 7.21 describes the results of Mann-Whitney U testing for E-commerce value creation outcomes.

Table 7.21 Consistent user interface and E-commerce value creation			
Metric	n <sub>1</sub>	n <sub>2</sub>	<i>p</i>
B2C revenues	30	11	0.632
Sales leads	23	9	0.509
New customers	26	10	0.876

**Legend:** n<sub>1</sub>=Pass, n<sub>2</sub>=Fail

Thus, analysis revealed no significant difference in E-commerce value creation outcomes at the significance level between sites that passed the consistent interface test and sites that failed the test.

Table 7.22 describes the results of Mann-Whitney U testing for association between *efficient navigation* and E-commerce value creation outcomes.

Table 7.22 Efficient navigation and E-commerce value creation			
Metric	n <sub>1</sub>	n <sub>2</sub>	<i>p</i>
B2C revenues	18	23	0.802
Sales leads	18	14	0.377
New customers	21	15	0.427

**Legend:** n<sub>1</sub>=Pass, n<sub>2</sub>=Fail

Thus, analysis revealed no significant difference in E-commerce value creation outcomes at the significance level between sites that passed the efficient navigation test and those that failed the test. The result is consistent with failures that were not severe and posed no serious usability problem to users.

As the descriptive statistics showed,<sup>149</sup> denial of user control was identified in only 3 (7%) of responding sites, too few cases for bivariate testing for association with E-commerce value creation outcomes. Table 7.23 describes Mann-Whitney U Exact test outcomes for sites that passed the *operational functionality* test.

Table 7.23 Operational functionality and E-commerce value creation			
Metric	n <sub>1</sub>	n <sub>2</sub>	<i>p</i>
B2C revenues	21	20	0.410
Sales leads	17	15	0.496
New customers	17	19	0.327

**Legend:** n<sub>1</sub>=Pass, n<sub>2</sub>=Fail

Sites that passed the test ranked better than sites that failed. However, no significant difference at the significance level was observed between operational functionality and any of the three E-commerce value creation metrics. The result suggested that the correct judgement had been made about the severity of issues encountered.<sup>150</sup>

Table 7.24 reports rank outcomes from Mann-Whitney U testing for differences in E-commerce value creation between firms that passed the *Efficient E-commerce transactions* test and firms that failed.

<sup>149</sup> Vide Section 7.2.3.6 p.244.

<sup>150</sup> *Ibid.*

Table 7.24 Ranks: Efficient E-commerce transactions and E-value creation				
Result		N	Mean Rank	Sum of Ranks
B2C revenues	Fail	6	5.33	32.00
	Pass	6	7.67	46.00
	Total	12		
Sales leads	Fail	5	5.80	29.00
	Pass	5	5.20	26.00
	Total	10		
New customers	Fail	4	5.13	20.50
	Pass	7	6.50	45.50
	Total	11		

Fifteen firms had implemented online fulfilment in the respondent group. The data set was further reduced by pair-wise exclusion of cases where no B2C revenue, sales leads or new customer data had been obtained via the E-commerce adoption survey. The data show that across two of the measures, namely B2C revenues and new customers, sites with efficient transactions did better than sites that were inefficient in terms of mean rank. However, exact 1-tailed test outcomes on this small sample did not show evidence of significant differences in E-commerce value creation between firms that passed the efficiency test and those that failed (see Table 7.25).

Table 7.25 Efficient E-commerce transactions and E-commerce value creation			
Metric	n <sub>1</sub>	n <sub>2</sub>	<i>p</i>
B2C revenues	6	6	0.152
Sales leads	5	5	0.393
New customers	4	7	0.285

**Legend:** n<sub>1</sub>=Pass, n<sub>2</sub>=Fail

The E-commerce efficiency test was extended to encompass secure transactions. Again, rank data suggested that sites implementing secure transactions achieved better B2C revenue and new customer outcomes than those that did not implement secure transactions (see Table 7.26).



Table 7.26 Ranks: Secure transactions and E-commerce value creation				
Result		N	Mean Rank	Sum of Ranks
B2C revenues	Fail	5	4.50	22.50
	Pass	5	6.50	32.50
	Total	10		
New customers	Fail	5	5.20	26.00
	Pass	5	5.80	29.00
	Total	10		
Sales leads	Fail	4	3.63	14.50
	Pass	3	4.50	13.50
	Total	7		

Table 7.27 reports the Exact 1-tailed test outcomes on this extremely small number of cases.

Table 7.27 Secure transactions and E-commerce value creation			
Metric	n <sub>1</sub>	n <sub>2</sub>	<i>p</i>
B2C revenues	5	5	0.167
Sales leads	3	4	0.343
New customers	5	5	0.421

**Legend:** n<sub>1</sub>=Pass, n<sub>2</sub>=Fail

Thus, Exact 1-tailed testing of E-commerce value creation outcomes on this small sample did not show evidence of any significant differences between firms that implemented secure transactions and those that did not. While promising in terms of rank outcomes, efficient E-commerce transactions and secure transactions involved small numbers and did not deliver outcomes significantly different at the significance level.

Does usability work with Cyber transformation to determine E-commerce value creation outcomes? Hypothesis set H<sub>19.1-19.4</sub> was designed to test this proposition:

H<sub>19.1-19.4</sub>: In association with Cyber Transformation, Return on Investment (H<sub>19.1</sub>), Revenue (H<sub>19.2</sub>), Sales leads (H<sub>19.3</sub>) and New Customer (H<sub>19.4</sub>) E-commerce value creation outcomes are related to Usability.

Clearly, results from bivariate correlational analysis using the nine point Usability scale were not encouraging. Tables 7.28 to 7.30 comprise ANOVA tables describing multiple linear regression of the two independent variables (Cyber transformation and Usability) and the three dependent E-commerce value creation measures.

Table 7.28 ANOVA: Cyber transformation, Usability and B2C revenues <sup>b</sup>					
Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	2602.083	2	1301.041	1.632	.209 <sup>a</sup>
Residual	30285.478	38	796.986		
Total	32887.561	40			

a. Predictors: (Constant), Usability, Cyber transformation

b. Dependent variable: B2C Revenues

Table 7.29 ANOVA: Cyber transformation, Usability and Sales leads <sup>b</sup>					
Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	20087.456	2	10043.728	3.460	.045 <sup>a</sup>
Residual	84187.513	29	2903.018		
Total	104274.97	31			

a. Predictors: (Constant), Usability, Cyber transformation

b. Dependent variable: Sales leads

Table 7.30 ANOVA: Cyber transformation, Usability and New Customers <sup>b</sup>					
Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	1782.814	2	891.407	0.935	.403 <sup>a</sup>
Residual	31471.742	33	953.689		
Total	33254.556	35			

a. Predictors: (Constant), Usability, Cyber transformation

b. Dependent variable: New customers

Only one result was significant at the required significance level- Sales leads. Table 7.31 describes shows that Cyber transformation is responsible for the observed effect:

Table 7.31 Coefficients: Cyber transformation, Usability and Sales leads, <sup>a</sup>					
Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	9.760	52.330		.187	.853
Cyber transformation	5.032	2.032	.416	2.476	.019
Usability	-8.863	7.687	-.194	-1.153	.258

In summary, no significant association at the significance level was demonstrated by the two factor model and E-commerce value creation outcomes, inclusive of Cyber transformation and Usability. The study was therefore obliged to return the null hypothesis in regard to the hypothesis set H<sub>19.2-19.4</sub>.

#### 7.3.8.1 Conclusions: Usability testing

Data analysis revealed only one Usability CSF (Logical information architecture) that entailed *marginally* significantly different E-commerce value creation outcomes corresponding to a pass or failure of the test<sup>151</sup>. Results, therefore, sit incompatibly with findings from the literature on Usability contained in *Chapters Two and Three* which suggested a possible new Usability dimension to the *Marketspace Model*. As CSF testing suggested, and subsequent regression testing showed, the two factor model inclusive of Cyber transformation and Usability is not sustainable on the basis of this data set.

<sup>151</sup> Vide Section 7.3.8, p.278.

Acknowledged limitations of the current study are important for putting the result in perspective. The character of the sample comprises one such limitation. Factors important here include:

- the small number of sites (15) implementing online fulfilment;
- the shallow depth and simple character of sites in the sample; and
- a preponderance of Usability issues that were not severe and unlikely to result in user abandonment of the site.

The shallow depth and simple character of sites meant that factors such as mental map, consistent interface and efficient navigation, even when poorly addressed by designers, did not entail severe issues for users. The most common source of failure of the operational functionality test was a recoverable error, namely, reliance upon a HTML/XHTML *mailto* function for user (client) feedback. By copying and pasting the contact email address to a mail client, the problem could be overcome by users and, while rightly regarded as a manifestation of poor site design, this issue would not in practice trigger severe usability consequences.

Changes to the research design involving replacement of the inspection method by user reference groups, might also have assisted in improving the reliability of testing. For example, whether the HTML/XHTML *mailto* function problem should be classified as a fatal or a recoverable error is best assessed with reference to data grounded in user experience, rather than prescriptively.

### 7.3.9 E-strategy and E-commerce value creation ( $H_{20}$ )

Is E-strategy associated with E-commerce value creation outcomes? The following hypothesis set describes such a relationship:

$H_{20.1-20.4}$ : Return on Investment ( $H_{20.1}$ ), Revenue ( $H_{20.2}$ ), Sales leads ( $H_{20.3}$ ) and New Customer ( $H_{20.4}$ ) E-commerce value creation outcomes are positively related to E-strategy adoption.

Golden *et al.* (2003) found a significant relationship between E-strategy adoption and sales leads ( $p = 0.025$ ). The non-parametric and ordinal character of data suggested that a Mann-Whitney U independent samples test would be most appropriate for assessing differences between E-strategy and the three measures of E-commerce value creation for which data was obtained.

Table 7.32 describes Exact 1-tailed Mann-Whitney U independent samples test outcomes from the current study:

Table 7.32 Strategy and E-commerce value Creation			
Metric	$n_1$	$n_2$	$p$
B2C revenues ( $H_{20.2}$ )	11	26	0.005
Sales leads ( $H_{20.3}$ )	10	22	0.017
New customers ( $H_{20.4}$ )	11	22	0.011

Legend:  $n_1$ = E-strategy;  $n_2$ = No E-strategy

Thus, using a Mann-Whitney U test, it is concluded that at the critical  $\alpha = 0.05$  value:

- a *highly* significant difference exists in B2C revenues outcomes between firms adopting E-strategy and firms with no such strategy ( $n_1=11$ ,  $n_2=26$ ,  $p=0.005$ );

- a significant difference exists in sales lead outcomes between firms adopting E-strategy and firms with no such strategy ( $n_1=10$ ,  $n_2=22$ ,  $p=0.017$ ); and
- a significant difference exists in new customers acquired between firms adopting E-strategy and firms with no such strategy ( $n_1=11$ ,  $n_2=22$ ,  $p=0.011$ ).

Results from testing are therefore sufficient to suggest rejection of the null hypothesis in the case of  $H_{20.2}$ ,  $H_{20.3}$  and  $H_{20.4}$ . Testing has confirmed the relationship between E-strategy adoption and sales leads identified by Golden *et al.* in their 2003 study. In this sample, the relationship can be extended to encompass the much harder revenue metric of B2C revenues ( $p=0.005$ ) and new customers acquired ( $p=0.011$ ). The finding therefore adds to the SME literature pointing to the role of strategy as a CSF in E-commerce adoption.

However, it should be noted that the incidence of E-strategy adoption is low, comprising some 35% of firms ( $n=40$ ). Extent of strategy adoption is disappointing, a situation explored further in the Chapters *Eight* and *Nine* discussions of networks (Rogers, 1995; Braun 2003) and training (Cragg and King, 1993; Darch and Lucas, 2002; Duan, Mullins, Hamblin, and Stanek, 2002; Micela, Roberti and Jacuzzi, 2002).

#### 7.3.10 E-Intelligence and E-strategy ( $H_{21}$ )

In *Chapter Two*, it was noted that according to Straub and Klein's (2001) theory of E-competitive transformation, the exploitation of information asymmetry denoted an omega or tertiary phase in the process of 'E-competitive transformation'. One attribute of this phase is the creation of a data warehouse about customers. E-metrics comprising performance metrics, such as site hits and site traffic, form important data sets in this warehouse. Additionally, marketing metrics such as unique visitors, return visitors, visitor

identities, recency, referrer sites and clickthrough rates would be expected to be found in the warehouse. The capability of constructing such a warehouse based on E-metrics and deploying it as part of E-strategy decision making has been described as one of *E-intelligence*. Hypothesis set H<sub>21.1</sub>-H<sub>21.4</sub> was aimed at determining if E-intelligence increases the likelihood of securing superior E-commerce value creation outcomes.

H<sub>21.1</sub>-H<sub>21.4</sub>: Return on Investment (H<sub>21.1</sub>), Revenue (H<sub>21.2</sub>), Sales leads (H<sub>21.3</sub>) and New Customer (H<sub>21.4</sub>) E-commerce value creation outcomes are positively related to E-intelligence.

Testing of H<sub>21.1-21.4</sub> proved problematic due to the reluctance of firms to provide useful insights into the gathering and use of E-metrics. Of the 40 firms that responded to the question, 21 (52.500%) used E-metrics and 19 (47.500%) made no use of these statistics. Insufficient responses were received on identity tracking and behaviour tracking to enable meaningful analysis. A Mann-Whitney U independent samples test was used to determine if any significant difference in E-commerce value creation outcomes existed in the sample between firms making use of E-metrics and firms that did not use E-metrics. Table 7.33 reports the results of 1-tailed testing with Mann-Whitney U:

Table 7.33 E-metrics and E-commerce value creation			
Metric	n <sub>1</sub>	n <sub>2</sub>	<i>p</i>
B2C revenues	17	19	0.035
Sales leads	17	13	0.024
New customers	18	14	0.175

**Legend:** n<sub>1</sub>=Use E-metrics, n<sub>2</sub>=Do not use E-metrics

Thus, a significant difference in E-commerce creation outcomes was evident with B2C revenues ( $p = 0.035$ ) and sales leads ( $p = 0.024$ ) between firms that used E-metrics as part of business strategy, and those that did not use E-metrics.

#### 7.3.11 Rated impact and satisfaction with E-commerce

As the failure to gather usable data on ROI illustrated, SMTE operational excellence could not be relied upon as measured by owner *grasp* of key firm E-performance metrics. Section 7.5.1.3 and 7.1.5.4 described the results of reliability testing of key E-metrics (B2C Revenues, sales leads and new customers acquired online). Testing enabled confidence in the data. A further test of reliability was incorporated into the design based on SMTE owner/operator estimates of the *rated* impact of E-commerce on the firm. Respondents were asked to rate the impact of E-commerce on a scale consisting of value criteria matched to *ordinal* category measures (None, Low, Moderate, High and Very High). The base set of criteria enabled triangulation with revenue and new customer data, gathered elsewhere in the survey. The complete set included:

- cost reduction (Item 5.1.1);
- new customers (Item 5.1.2);
- customer relationship enhancement (Item 5.1.3);
- operational efficiency (Item 5.1.4);
- beneficial alliances and collaborations with other firms (Item 5.1.5);
- entry into new markets (Item 5.1.6);
- increased revenue earned per employee (Item 5.1.7); and



- improved return on assets (Item 5.1.8).

The data were then subjected to a Chi Square goodness of fit test to see if significant differences of frequency existed across response categories. Table 7.34 describes Chi Square outcomes from this testing.

Table 7.34 E-commerce Impacts: Chi Square Goodness of Fit Outcomes		
Rated impact on:	n	<i>p</i>
Cost reduction	38	0.125
New customers	38	0.078
Customer relationships	38	0.002
Operational efficiency	38	0.000
Alliances and collaborations	38	0.186
Entry into new markets	38	0.186
Increased revenue per employee	38	0.005
Improved return on assets	38	0.004

Thus, *highly* significant differences in the frequency of rated impacts were observed with *customer relations*, *operational efficiency*, *increased revenue earned per employee* and *improved return on assets*. No significant differences were evident with *cost reduction*, *alliances and collaborations*, nor *entry into new markets*.

The sample was *decided* on the value of E-commerce for enhancing *customer relations*, returning a result that was highly statistically significant. The result provided *triangulatory* confirmation of an earlier finding from quantitative cluster analysis of SB transformation that pointed to the importance of customer relations as a contributor E-commerce value creation.<sup>152</sup> More firms rated the impact of E-commerce on increased revenue per employee and

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<sup>152</sup> Vide Section 7.3.7, p.273.

return on assets as 'Low' or 'None' compared with other response categories and the results were found to be *highly* statistically significant.

However, the sample was *undecided* on the impact of E-commerce on cost reduction, alliances and collaborations and entry into new markets. Inspection of the data showed that 47% firms rated the impact of E-commerce on alliances and collaboration as 'Low' or 'None'. Almost half of firms in the sample have not formed, or are experiencing difficulty in forming strategic online partnerships. Twenty one percent see the impact of E-commerce on the formation of new markets as 'None' or 'Low' and a further 45% see the impact as 'Moderate'. Clearly, firms in the sample are experiencing difficulty in harnessing E-commerce to develop new markets.

The data on E-commerce satisfaction were similarly submitted to a Chi square goodness of fit test. More firms were found to be 'Satisfied' or 'Extremely Satisfied' with E-commerce outcomes than neutral, or dissatisfied, and the result was statistically significant ( $n=43, p=0.039$ ). However, in the course of data gathering it became clear that satisfaction with E-commerce depended upon expectations. Attribution of meaning to the goodness of fit test is therefore problematic. A more useful test involved cross-tabulation of satisfaction with SB transformation and Cyber transformation. The Cyber transformation test did not deliver evidence of significant association ( $n=46, p=0.256$ ). However, SB transformation outcomes were found to be *highly* significantly associated with E-commerce satisfaction ( $n=46, p=0.007$ ). The result provides *triangulatory* support for a finding from E-commerce value creation testing, namely, that SB transformation is more important in observed variation in E-commerce value creation outcomes, than TC transformation.<sup>153</sup>

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<sup>153</sup> Vide Section 7.3.7, p.273.

## 7.3.12 Sector analysis: The role of product fit

Hypothesis set H<sub>22</sub>, was devised to investigate sectoral influences on E-value creation outcomes:

H<sub>22.1</sub>: Return on Investment in online is related to industry sector.

H<sub>22.2</sub>: Percentage of revenues earned online is related to industry sector.

H<sub>22.3</sub>: The number of sales leads generated by online is related to industry sector.

H<sub>22.4</sub>: The percentage of new customers acquired online is related to industry sector.

Crosstabulation of E-commerce value creation outcomes and sectors showed significant association between outcomes and sectors. Crosstabulation outcomes are described in Tables 7.35-7.37.

Table 7.35 Crosstabulation: B2C revenues by sector						
E-metric		Sector				Total
		Tours	Accom.	Tours & Accom.	Attraction	
B2C revenues	< Median	17	2	1	1	21
	>= Median	8	9	4	0	21
Total		25	11	5	1	42

Table 7.36 Crosstabulation: Sales leads by sector						
E-metric		Sector				Total
		Tours	Accom.	Tours & Accom.	Attraction	
Sales leads	< Median	10	2	0	1	13
	>= Median	7	8	3	1	19
Total		17	10	3	2	32

Table 7.37 Crosstabulation: New customers by sector						
E-metric		Sector				Total
		Tours	Accom.	Tours & Accom.	Attraction	
New customers	< Median	14	1	1	1	17
	>= Median	8	8	3	0	19
Total		22	9	4	1	36

Table 7.38 reports the Chi-Square test outcomes.

Table 7.38 E-commerce value creation and sector outcomes		
Chi-Square Median Test		
Metric	n	<i>p</i>
B2C Revenues	42	0.008
Sales leads	32	0.086
New Customers	36	0.014

Thus, crosstabulation and test outcomes show that across two of three measures, B2C revenues and new customers, at-or-above median outcomes are significantly associated with operational sector. The result is sufficient to enable rejection of the null hypothesis in the case of  $H_{22.2}$  and  $H_{22.4}$ . Accommodation and mixed business E-retailers do better than tour operators and the frequency distributions are significantly different at  $\alpha = 0.05$ . Attraction providers were not significantly represented in survey respondents. In interview, the one attraction provider who agreed to participate in the survey described the disinterest of others as attributable to “poor product fit” for the sector:

Attraction operators have mostly given up on the Internet. We operate a gateway to the Daintree (an attraction). Our service is not suited to the Internet, and revenue from the Internet channel is insignificant. The benefits that we get from the Internet are not quantifiable in terms of revenue stream. You need a bookable product to be successful in tourism on the Internet. For us the role of the Internet is purely motivational. Our market is constructed around free independent travellers. Internet helps to get them to the gate, but the action is not there in terms of buying online.

Multiple linear regression can be used to assess the relative contribution of independent variables to the behaviour of a dependent variable in linear association. Inferential analysis concluded with a multiple linear regression analysis of factors assessed in bivariate testing as significant in E-commerce value creation outcomes.<sup>154</sup>

#### 7.3.13 Multiple Linear Regression: SB transformation and the role of strategy

Strategy informs and shapes SB transformation, but involves factors outside the business domain, such as strategy for Search Engine Optimization (SEO). Is strategy more important than business transformation in determining E-commerce value creation outcomes? Both factors have been shown to be at work in determining B2C revenue outcomes in bivariate testing.<sup>155</sup> Following assumption testing, a multiple linear regression was performed. The ANOVAs were significant at the  $\alpha = 0.05$  significance level. Tables 7.39-7.40 describe model summary and coefficient outcomes.

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<sup>154</sup> In assumption testing for standard regression, Coakes and Steed (2003, p.163) declare that the *ideal* requirement for regression involves twenty times the number of cases as *independent* variables. This requirement was observed in testing.

<sup>155</sup> Vide Sections 7.3.7, p.273 and 7.3.9, p.286.

Table 7.39 ANOVA: B2C revenues, strategy and SB transformation <sup>b</sup>					
Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	7692.18	2	3486.093	5.406	.009 <sup>a</sup>
Residual	24189.00	34	711.41		
Total	31881.19	36			

a. Predictors: (Constant), Strategy, SB Transformation

b. Dependent variable: B2C Revenues

Table 7.40 Coefficients: B2C revenues, SB transformation <sup>a</sup>					
Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	5.630	11.929		.472	.640
SB Trans.	1.822	1.261	.223	1.444	.158
Strategy	24.613	9.935	.383	2.477	.018

b. Dependent variable: B2C Revenues

In the two factor model, strategy subsumes SB transformation and is the *best* predictor of B2C Revenue outcomes. Would regression testing of a model that eliminated variables in the SB dimension shown *not* to be significant in bivariate testing for association with B2C revenues, but which also included other factors shown in bivariate testing to be significant, yield the same conclusion about the centrality of strategy in predicting B2C revenue outcomes?<sup>156</sup> A revised model was tested based on the factors of *strategy, promotion transformation, customer relations transformation and sector*. The result was found to be significant at the  $\alpha = 0.05$  level, yielding in  $R^2$  of 31.4% of the observed outcome. Table 7.41 shows that in the enhanced model strategy remains the best predictor of B2C outcomes:

<sup>156</sup> Vide Section 7.3.7, p.

Table 7.41 Coefficients: B2C revenues, SB transformation and strategy<sup>b</sup>

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	-4.437	12.477		-0.356	.724
Strategy	19.913	10.179	.310	1.956	.059
C/Relations	.339	3.070	.020	.110	.913
Promotion	4.586	3.147	.270	1.457	.155
Sector	8.026	5.519	.216	1.454	.156

b. Dependent variable: B2C revenues

The result suggests that in this industry/sector refinement of the Cyber transformation model is necessary to account for strategy, as the best predictor of outcomes relative to other factors. The result is revisited in the concluding discussion of RBV and Cyber transformation theory.

#### 7.3.14 Multiple Linear Regression: Cyber transformation and the role of strategy

It remains to resolve the role of Dutta and Segev's (2001) Marketspace Model in E-commerce value creation outcomes observed. The analysis so far has shown that the independent variables of SB transformation and strategy are important in determining B2C revenue outcomes, and that of the two, strategy is the best predictor of B2C revenue outcomes. Elsewhere, it has been shown that Cyber transformation was also significantly positively related with B2C revenues.<sup>157</sup> Given outcomes obtained with testing of SB transformation, the prediction seems reasonable that strategy would again prove the best predictor of B2C revenue outcomes. Tables 7.42 and 7.43 report the results from regression analysis testing of the two factor model inclusive of strategy and Cyber transformation:

<sup>157</sup> Vide Table 7.10, p.256.

Table 7.42 ANOVA: B2C Revenues, Cyber transformation and strategy <sup>b</sup>					
Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	7778.777	2	3889.388	5.487	.009 <sup>a</sup>
Residual	24102.412	34	708.894		
Total	31881.189	36			

a. Predictors: (Constant), Cyber transformation, Strategy

b. Dependent variable: B2C Revenues

Table 7.43 Coefficients: B2C revenues, Cyber transformation and strategy <sup>a</sup>					
Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	-.133	15.031		.009	.993
Cyber trans.	1.309	.879	.225	1.489	.146
Strategy	25.934	9.712	.404	2.670	.012

b. Dependent variable: B2C Revenues

The prediction was confirmed. However, regression testing of Sales leads provides an interesting variation on the picture. Tables 7.44 and 7.45 report the results from testing:

Table 7.44 ANOVA: Sales leads, Cyber transformation and strategy <sup>b</sup>					
Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	22849.200	2	11424.600	4.069	.028 <sup>a</sup>
Residual	81425.769	29	2807.785		
Total	104274.97	31			

a. Predictors: (Constant), Cyber transformation, Strategy

b. Dependent variable: Sales leads



Table 7.45 Coefficients: Sales leads, Cyber transformation and strategy<sup>a</sup>

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	-37.310	35.751		-1.044	.305
Cyber trans.	4.420	2.000	.365	2.210	.035
Strategy	31.244	20.347	.254	1.536	.135

b. Dependent variable: Sales leads

Thus, Cyber transformation is a better predictor of sales lead outcomes than strategy, suggesting the role of technological capability transformation in generating sales leads.

### 7.3.15 Summary: Hypothesis testing and inferential analysis

Table 7.46 summarizes the results of hypothesis testing and inferential analysis:

Table 7.46 Results from Hypothesis Testing	
Hypothesis	Results
H <sub>1</sub> : Cyber transformation is low.	The data showed that inferior Cyber transformation outcomes are typical and the null hypothesis was rejected in favour of H <sub>1</sub> . <sup>158</sup>
H <sub>2</sub> : Cyber transformation achieved is positively related to firm size and turnover.	<p>Analysis revealed significant positive association between</p> <ul style="list-style-type: none"> <li>firm size and Cyber transformation in the sample (n=46, rho=0.271, <math>p = 0.034</math>); and</li> <li>firm turnover and Cyber transformation in the sample (n=37, rho=0.299, <math>p = 0.036</math>).</li> </ul> <p>The results were sufficient to reject the null hypothesis in the case of H<sub>2</sub>.<sup>159</sup></p>

<sup>158</sup> Vide Section 7.3.1, p.250.

<sup>159</sup> Vide Section 7.3.2, p.251.

<p>H<sub>3.2-3.4</sub> E-commerce value creation is positively related to Cyber transformation outcomes.</p>	<p>Analysis revealed that:</p> <ul style="list-style-type: none"> <li>• a significant, but weak association exists between Cyber transformation outcomes and B2C revenues (n=42, rho=0.278, <math>p = 0.037</math>) at the significance level;</li> <li>• a highly significant, moderate association exists between Cyber transformation and sales leads (n=32, rho=0.496, <math>p = 0.002</math>); and</li> <li>• no significant association exists between Cyber transformation and new customers acquired online (n=36, rho=0.215, <math>p = 0.103</math>).</li> </ul> <p>Cyber transformation outcomes are significantly positively related to E-commerce value creation outcomes inclusive of B2C revenues (H<sub>3.2</sub>) and sales leads (H<sub>3.3</sub>).<sup>160</sup></p>
<p>H<sub>4.1-4.4</sub>: Firms enjoying early adopter advantage achieve superior E-commerce value creation outcomes.</p>	<p>The results did not allow rejection of the null hypothesis at the significance level. No significant association between years in E-commerce and E-commerce value creation outcomes could be demonstrated.<sup>161</sup></p>
<p>H<sub>5.1-5.4</sub>: E-commerce value creation outcomes are positively related to E-commerce budgets.</p>	<p>Analysis showed that the null hypothesis (H<sub>0</sub>: <math>\rho = 0</math>) could not be excluded in the cases of H<sub>5.2</sub> and H<sub>5.4</sub>. Concluded that E-commerce budgets do not fundamentally determine E-commerce value creation outcomes.<sup>162</sup></p>

<sup>160</sup> Vide Section 7.3.3, p.254.

<sup>161</sup> Vide Section 7.3.4, p.159.

<sup>162</sup> Vide Section 7.3.5, p.255.

H <sub>6.1-6.4</sub> : E-commerce value creation outcomes are positively related to <i>Technological Capability</i> transformation outcomes.	Analysis showed that at the significance level, the null hypothesis could not be rejected for H <sub>6.2</sub> and H <sub>6.4</sub> on the available data. The analysis did, however, show a weak <i>marginal</i> positive association at slightly above the significance level between TC scores and sales leads (n=32, rho=0.294, $p = 0.051$ ). <sup>163</sup>
H <sub>7-H11</sub> : Cluster transformation outcomes in the TC dimension are positively related to E-commerce value creation.	Analysis showed that the null hypothesis (H <sub>0</sub> : $\rho = 0$ ) could not be excluded in the cases of H <sub>7</sub> to H <sub>10</sub> . No mobile integration was found in the sample enabling testing of H <sub>11</sub> . <sup>164</sup>
H <sub>12.1-12.4</sub> : E-commerce value creation outcomes are positively related to <i>Strategic Business</i> transformation outcomes.	<p>Analysis revealed that:</p> <ul style="list-style-type: none"> <li>• a significant moderate positive association exists between SB transformation and B2C revenues (n=42, rho=0.318, <math>p = 0.020</math>) at the significance level;</li> <li>• a highly significant moderate positive association exists between SB transformation and sales leads (n=32, rho=0.516, <math>p = 0.001</math>) at the significance level; and</li> <li>• a marginally significant positive association exists between SB transformation and new customers (n=36, rho=0.236, <math>p = 0.083</math>)</li> </ul> <p>The result enabled rejection of the null hypothesis in the cases of hypotheses H<sub>12.2</sub> and H<sub>12.3</sub> and is a much stronger result on association than that shown in analysis of TC dimension outcomes.<sup>165</sup></p>

<sup>163</sup> Vide Section 7.3.6, p.262.

<sup>164</sup> *Ibid.*

<sup>165</sup> Vide Section 7.3.7, p.269.

H <sub>13.1-13.4</sub> : E-commerce value creation outcomes are positively related to Product transformation.	Analysis showed no significant association at the significance level between Product Transformation and any of the three E-value creation metrics for which data was obtained. Thus, the evidence does not enable rejection of the null hypothesis in the case of hypothesis set H <sub>13</sub> . <sup>166</sup>
H <sub>14.1-14.4</sub> : E-commerce value creation outcomes are positively related to Promotion transformation.	Analysis showed that a significant positive association exists between Promotion transformation and <i>all</i> three E-commerce value creation metrics, sufficient to reject the null hypothesis H <sub>14.2-14.4</sub> . <sup>167</sup>
H <sub>15.1-15.4</sub> : E-commerce value creation outcomes are positively related to Price transformation.	Analysis showed no significant association at the significance level between Price Transformation and any of the three E-value creation metrics for which data was obtained. Thus, the evidence does not enable rejection of the null hypothesis in the case of hypothesis set H <sub>15</sub> . <sup>168</sup>
H <sub>16.1-16.4</sub> : E-commerce value creation outcomes are positively related to Place transformation.	Analysis showed no significant association at the significance level between Place Transformation and any of the three E-value creation metrics for which data was obtained. Thus, the evidence does not enable rejection of the null hypothesis in the case of hypothesis set H <sub>16</sub> . <sup>169</sup>
H <sub>17.1-17.4</sub> : E-commerce value creation outcomes are positively related to Customer relations transformation.	Analysis shows that Customer relations transformation is significantly, moderately positively associated with B2C revenues (n=42, rho=0.302, p=0.026) and sales leads (n=32, rho=0.335, p=0.030). The evidence of positive association is sufficient to reject the null hypothesis in the case of H <sub>17.2-17.3</sub> . <sup>170</sup>

<sup>166</sup> Vide Section 7.3.7, p.273.

<sup>167</sup> *Ibid.*

<sup>168</sup> Vide Section 7.3.7, p.273.

<sup>169</sup> *Ibid.*

<sup>170</sup> *Ibid.*

H <sub>18.1-18.4</sub> : E-commerce value creation outcomes are positively related to Usability.	Analysis revealed no significant association between Usability and any of the three E-commerce value creation metrics. <sup>171</sup>
H <sub>19.1-19.4</sub> : In association with Cyber Transformation, E-commerce value creation outcomes are related to Usability.	Analysis revealed no significant association at the significance level between the two factor model inclusive of Cyber transformation and Usability and E-commerce value creation outcomes. The study was therefore obliged to return the null hypothesis in regard to the hypothesis set H <sub>19.2-19.4</sub> . <sup>172</sup>
H <sub>20.1-20.4</sub> : E-commerce value creation outcomes are positively related to E-strategy adoption.	<p>Analysis with a Mann-Whitney U test, showed that at the critical value:</p> <ul style="list-style-type: none"> <li>• a highly significant difference exists in B2C revenues outcomes between firms adopting E-strategy and firms with no such strategy (<math>n_1=11, n_2=26, p=0.005</math>);</li> <li>• a significant difference exists in sales lead outcomes between firms adopting E-strategy and firms with no such strategy (<math>n_1=10, n_2=22, p=0.017</math>); and</li> <li>• a significant difference exists in new customers acquired between firms adopting E-strategy and firms with no such strategy (<math>n_1=11, n_2=22, p=0.011</math>).</li> </ul> <p>The result was sufficient to enable rejection of the null hypothesis in the case of the set H<sub>20.2</sub> to H<sub>20.4</sub>.<sup>173</sup></p>
H <sub>21.1-21.4</sub> : E-commerce value creation outcomes are positively related to E-intelligence.	Analysis showed a significant difference in E-commerce creation outcomes was evident in terms of B2C revenues ( $p = 0.035$ ) and sales leads ( $p = 0.024$ ) between firms that used E-metrics as part of business strategy, and those that did not use E-metrics. <sup>174</sup>

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<sup>171</sup> Vide Section 7.3.8, p.274.

<sup>172</sup> Vide Section 7.3.8, p.283.

<sup>173</sup> Vide Section 7.3.9, p.286.

<sup>174</sup> Vide Section 7.3.10, p.288.

H <sub>22.1-22.4</sub> : E-commerce value creation is related to industry sector.	Analysis showed that across two of three measures, B2C revenues ( $p = 0.008$ ) and new customers ( $p = 0.014$ ), at-or-above median outcomes were significantly different with operational sector. The result was sufficient to enable rejection of the null hypothesis in the case of H <sub>22.2</sub> and H <sub>22.4</sub> . <sup>175</sup>
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Thus, inferential statistical analysis demonstrated that:

- in relation to two of three E-value creation measures (B2C revenues and sales leads), Cyber transformation is significantly *positively* related to E-value creation outcomes in this SMTE sample. However, the strength of this association as measured by *rho* is weak; and
- in terms of the dimensional model, the principal contributor to the observed effect is SB transformation based on the *Marketspace* quadrants of Promotion and Customer relations. The TC dimension does not significantly contribute to the observed effect in this SMTE sample.

It had been hypothesized that Usability might function as an intervening variable in the determination of E-commerce value creation outcomes. However, results showed no significant positive association between Usability and E-commerce value creation outcomes. Analysis showed that while respondent sites displayed Usability issues, few severe issues were encountered and insufficient variability existing in the data to allow reliable conclusions about the role of Usability. Conclusions from analysis of descriptive statistics and inferential analysis are discussed in *Chapter Nine*.

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<sup>175</sup> Vide Section 7.3.12, p.292.

## 8 Data analysis and interpretation II: Portal quasi-experiment

### 8.1 Data Analysis and Interpretation Overview

The *Cape Range Ningaloo Ecovortal*, a vertical market portal that supplied a range of Ecotourism services to the Cape Range Ningaloo region, comprised a third quasi-experimental, triangulatory component to the research design. The logic and design of the proof of concept portal experiment are discussed in *Chapter Five*. The project to create the heritage hub commenced in July, 2001. An extranet enabled version of the site went live in December 2002. Beta testing of the live site commenced in February 2003. Pre-trial baseline measurement of pre-portal E-commerce value outcomes commenced in April 2003, concurrent with adoption of the portal as a home page at the *Exmouth Visitor Centre*. Nine local Ecotourism businesses adopted the portal innovation by creating projects on the site. A mobile data integration capability based on SMS was extended to the portal in June 2003. However, this capability was not adopted by operators, involving a breach of the participation protocol negotiated with owner/operators in April 2003.

This analysis and interpretation of the field experiment consists of:

- a Web log analysis of user activity on the portal;
- an analysis and interpretation of interviews conducted as part of fieldwork; and
- a Social Network Analysis (SNA) of the ad-hoc E-commerce knowledge and information network encompassing adopters in the portal group.

Discussion of portal outcomes completes the data analysis and interpretation.

## 8.2 Web Log Analysis

### 8.2.1 Tools and limitations

Two web log analysis packages, *Web Log Stormer*<sup>176</sup> and *Summary*<sup>177</sup>, were used to analyze Internet Information Server (IIS) logs created by the portal server host. Two software packages were used, firstly, because no single package contained the complete suite of capabilities sought and, secondly, in the absence of industry standards for analysis, assurance required the checking of analysis outcomes.

The analysis was conducted with limited license versions of these analysis software packages, a limitation imposed by the small operating budget for the portal project (\$5K). The budget precluded configuration of the host as a proxy server and precluded purchase of analyzer software with data mining capability. This limitation was most acutely felt in the area of log information describing referrer domains and search engine keywords. Consequently, the analysis performed is not as rich as that available from most proxy servers using sophisticated analysis tools. Other acknowledged limitations include possible errors in aggregate traffic analysis arising from hacker attacks, activity attributable to search engine robots and poor system accounting of some kinds of activity, e.g., activity concerning ColdFusion (.cfm) extension objects. These limitations do not preclude reliable and useful analysis, particularly at the level of document libraries and aggregate trends.

### 8.2.1 Analysis- Aggregate trends

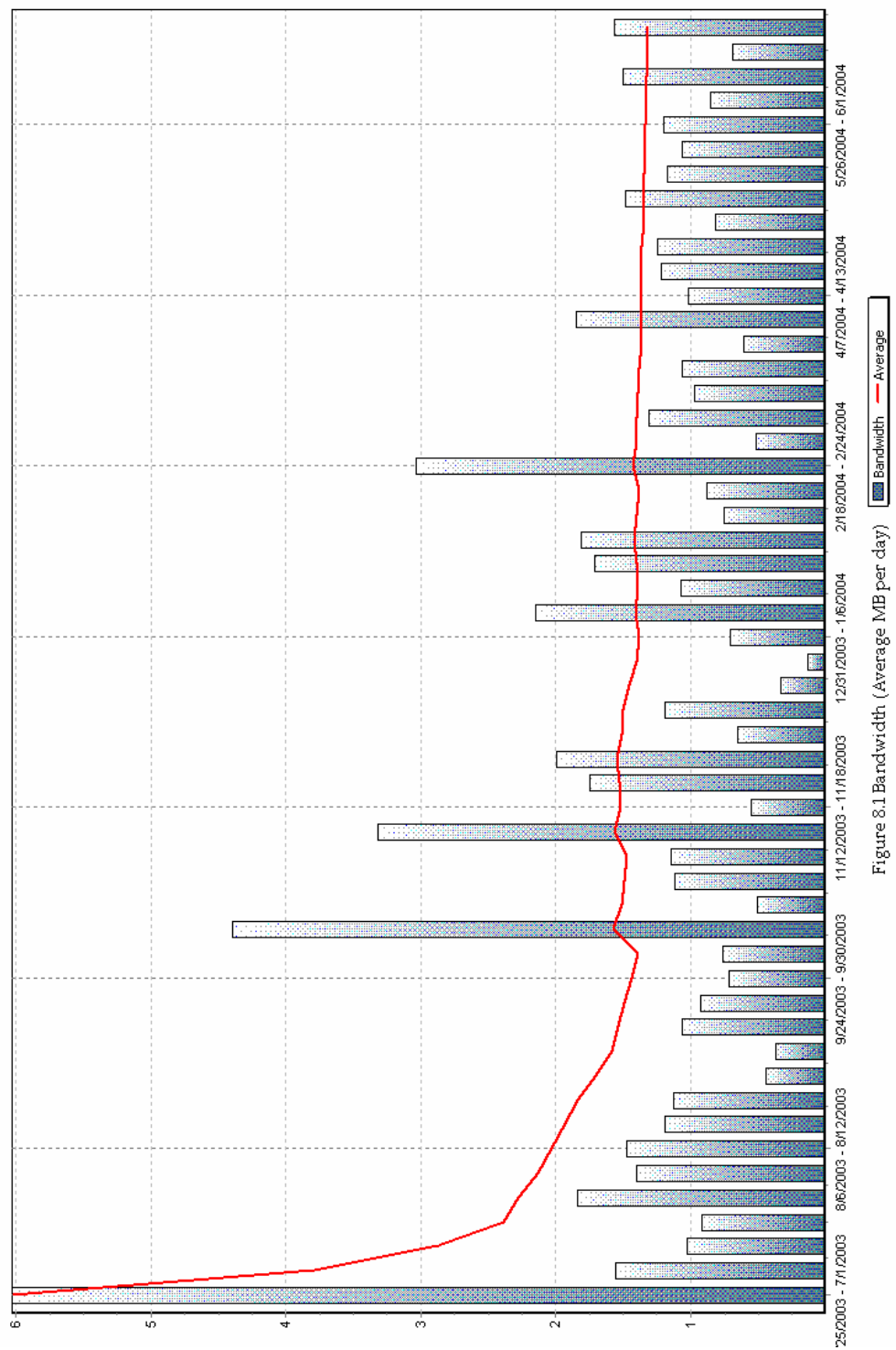
Figure 8.1 shows bandwidth served per day by the project server from July, 2003 when the portal achieved a Google ranking.

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<sup>176</sup> Dataland Software. (2003). *Web Log Storming*. Retrieved 10 December, 2004 from <http://www.datalandsoftware.com/weblog/>.

<sup>177</sup> Summary.Net (2004). *Summary: We Tell You More*. Retrieved 16 December, 2004 from <http://summary.net/summary.html>.





From an initial spike of 6.03Mb per day, bandwidth served tailed off to an average of 1.32Mb per day for the report period. The total number of visitors as measured by unique IP numbers was 4,467 during the report period. Table 8.1 describes in summary form aggregate statistics for the report period.

Table 8.1 Summary statistics: Cape Range Ningaloo Ecovortal <sup>178</sup>		
Sessions and hits	Total sessions	4467
	Average sessions per day	12.22
	Total hits	128460
	Average hits per day	351.20
	Average hits per session	28.75
Page views and download	Total different pages viewed	931
	Total different files downloaded	135
Visitors	Total visitor IP addresses	4467
	Average sessions per IP address	4.95

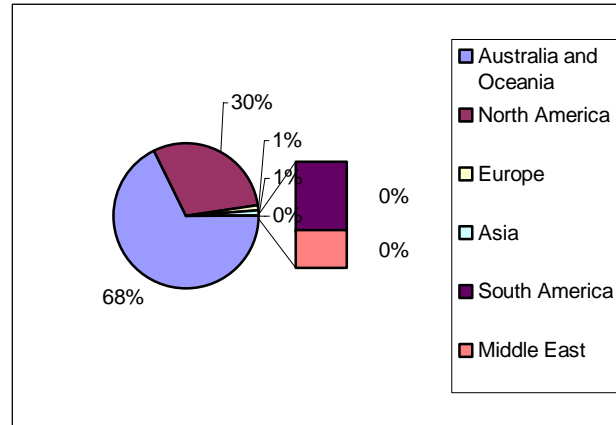
Analysis of top level domains in *Summary*, showed that 67% of domain IPs could not be resolved and that only 33% of overall activity on the site could be genuinely attributed to visitor activity outside the host domain and search engines. The proportion of unresolved traffic is higher than might be expected, because a single machine was used both as a test bed and production server, resulting in an abnormally high number of requests originating from within the *.ecu.edu.au* parent domain. The figure is also inclusive of search engine traffic (e.g., robots) which according to McCarthy (2001) can account for up to 40% of traffic to a web site.

#### 8.2.2 Analysis- Portal visitors by country of origin/market

Figure 8.2 depicts visits made to the site by region as measured by reverse lookup of the requesting IP number, excluding visits that could not be resolved to an IP address. The chart shows that the portal audience was primarily Australian, followed by North American and European visitors

<sup>178</sup> Sourced from WeblogStormer.

during the report period. Referrer logs were not available to enable further analysis of visitations by requesting domain.



**Figure 8.2 Resolved visitors by region (%)**

### 8.2.3 Analysis- Projects and services

What characteristics of the markets can be inferred? In the absence of log files describing referrer domains and search engine keywords, inferences about the portal market relied upon query analysis and page views served. Core portal functionality enabled registered users to create and populate projects that related to the thematic mission of the portal, namely, the biodiversity, ecology and ecotourism services of the region of *Cape Range Ningaloo*. A user could register on the system as a Project Owner or Subscriber. During the trial period, Ecotourism operators registered as Project owners on the system. Project document libraries consisted of Web and non-Web format information objects comprising *video, interactive movies, images, text and multimedia documents*.

Table 8.2 describes the *Web Log Stormer* query count for projects on the site as measured by parameter value ID. The queries studied construct user views of operator and interpretive information resource libraries (common property resources on the vortal). Analysis of the query count provides evidence of the most popular projects on the site and user behaviour.

Table 8.2 Projects by Query Count			
ID	Type	Project name	Query count
43	IR	Birds of Cape Range	210
13	ADM	Cape Range Ningaloo Vortal System	166
59	EO	3 Islands Marine tours	139
35	IR	History of Mauds Landing	138
37	EO	Coral Breeze Coastal Cruises	138
36	EO	Quad Treks	133
40	EO	Sea Breeze Resort	132
58	IR	Ningaloo Marine Park Turtle	125
38	EO	Four Wheel Bike Adventures	123
52	IR	(FAQs) (Frequently Asked Questions)	120
56	EO	Ningaloo Safari Tours	120
51	EO	Yardie Creek Tours	119
30	IR	Effect of No Fishing Zones in Ningaloo	119
41	EO	Whale Shark Eco Tours	116
54	IR	Ningaloo Reef Sea Kayak Trail	116
67	IR	Ocean Surface circulation on the	115
57	EO	Whale sharks of the Ningaloo Reef	110
18	IR	Spinifiex plant diversity	109
55	IR	Low impact development	108
53	IR	General Information and brochure	106
62	IR	Shothole Canyon	100
61	EO	Capricorn Kayak Tours	99
60	EO	Vlaming head lighthouse	95
68	IR	Summer surface circulation off the	92
63	IR	Marine Turtle Species Recovery Project	89

Legend: EO= Ecotourism Operator; IR= Interpretive or information resource

The top performing project in terms of executed queries was an interpretive resource on the bird life of Cape Range Ningaloo (ID=43) created by wildlife author Michael Morcombe. The project incorporated Quicktime video, multimedia and image objects that introduced species common to the area, their habitats and distribution. The top five projects in terms of executed queries, excluding Vortal Administration (ID=13), included both interpretive and ecotourism operator owned sites. Was the number of executed queries

significantly different between Ecotourism operator projects than interpretive or informational projects?

The distribution was tested for normality, found to be negatively skewed ( $\gamma = -0.751$ ) and non-normal according to the Kolmogorov-Smirnov statistic (0.017). Application of a Mann-Whitney U test showed no significant difference at the critical value  $\alpha = 0.05$  between the number of operator project queries and interpretive or information resource project queries ( $n_1 = 12$ ,  $n_2 = 13$ ,  $p = 0.531$ ).

Further investigation revealed that whether a project appeared in the whole of portal project inventory view, *significantly* determined whether a project was viewed as measured by the query count ( $n = 28$ ,  $r = -0.695$ ,  $p = 0.001$ ). The finding suggests that visitors more commonly displayed *browsing* behaviour, rather than *task* oriented searching behaviour using the site search facility. To corroborate this finding, the number of page views during the report period generated by the whole of portal project inventory query (Viewallproject1.cfm) was compared with the number of page views generated by project keyword (Searchproject.cfm), document type (Searchdocument.cfm) and place queries (Searchbyplace.cfm). Table 8.3 shows the results:

Table 8.3 Page views by query	
Query	Page views
Viewallproject1.cfm	540
Searchproject.cfm	142
Searchdocument.cfm	131
Searchbyplace.cfm	114

The whole of portal project browsing query (Viewallproject1.cfm) recorded more page views than all categories of search engine based queries performed on the system.

A further question concerned whether projects with superior Cyber transformation rankings were ‘stickier’ than sites with lower rankings. Low level transformation projects on the portal comprised electronic brochures in Acrobat (pdf) format. Higher level transformation projects incorporated multimedia, video and/or interactive Flash. However, time spent by visitors viewing projects and project document library objects could not be extracted from log data using either analysis package. Likewise, log files were silent on return visits. In the absence of log information enabling the measurement of project visit duration and return visits, no reliable conclusions could be drawn about site stickiness.

#### 8.2.4 Analysis- Uploaded objects, projects created and subscribers

Table 8.4 describes aggregate activity in terms of projects created during the report period, documents uploaded to project libraries and owner/operator accounts created on the site:

Table 8.4 Projects created, Documents	
Projects created	25
Documents uploaded	81
Extensions	pdf; .swf; .jpg; .mov;
Owner/operator accounts created	25

During the report period 81 documents were uploaded to project libraries. Review of server logs shows that these documents were uploaded following the second field visit to the region by the project team in April 2003. In the same period, 25 owner/operator accounts were created. These projects encompassed the academic, activist and Ecotourism owner/operator communities.

#### 8.2.5 Log Analysis Summary and interpretation

Investigation of domain data showed that around one third of overall traffic could be regarded as genuine and this data was subjected to further testing. The aim of this testing was to determine what kind(s) of value the portal had

generated for the tourism businesses that were represented by projects. In the absence of search engine keywords and referrer domain data, value measurement relied upon query analysis and page views. Application of a Mann-Whitney U test, showed that no significant differences existed between the number of project queries involving ecotourism owner/operator sites and interpretive and other information projects. Visitors did not significantly prefer tourism related projects over information or interpretive resources. No inference could be drawn about whether such behaviour was typical of what Buhalis (2003, p.313) describes as the 'new tourist' who is interested in educational and environmental issues, or merely suggestive of browsing behaviour by a wider audience of visitors. Inferential analysis of the query count revealed that page rank was significantly, negatively associated with project views as measured by the query count. The association was found to be *highly* significant at the critical value  $\alpha = 0.01$  and strength of association as measured by the correlation coefficient suggested *moderate* association ( $r = -0.695$ ). Such a finding suggests issues for the designers of vertical market portal solutions, but provides no insights in terms of the RQs forming the research agenda for this thesis. A finding consistent with low levels of E-commerce value creation for project owners comes from the analysis of page views that are specific to the tourism domain-the owner operator/owner directory (oplist.cfm) and a visit planner (planner.cfm). The combined page views for both measured over the account period was 331.

In summary, the bandwidth served, the high proportion of unresolved IP traffic, the identification of no significant differences between tourism and non-tourism project queries, and the small number of tourism specific page views, all suggest low levels of E-commerce value creation to the businesses represented on the site. However, no conclusive finding regarding E-commerce value creation is possible in the absence of data describing referrer domains, search engine keywords and sales leads generated.

Aggregate bandwidth trends describe a passive site in which content depth, quality and membership were insufficient to fuel sustained user growth. Beyond initial upload activity, members of the adopter group did not commit to the project with further uploads paving the way for achievement of supply side (membership) and demand side (user) critical mass (Preece, 2000).

### *8.3 Fieldwork: Portal interviews and observations*

Qualitative data, in the form of notes from interviews with firm owner/operators, was compiled during administration of the *E-commerce Adoption Survey*<sup>179</sup> and also as a consequence of field trips made to the Cape Range Ningaloo region to consult with stakeholders in the portal quasi-experiment. In December, 2004 Ecotourism operators with accounts on the system were also interviewed to assess their reaction to the experiment and reasons for not committing to the project. Analysis and interpretation of this data, together with field observations and a Social Network Analysis of E-commerce knowledge and information flows in the portal group concludes the data analysis and interpretation. To protect the confidentiality of subjects and to satisfy the privacy and confidentiality protocol agreed with interviewees, no real names are used. For consistency with the social network analysis, subjects are referred to by their node names (N1, N2 etc.).

#### *8.3.1 Design and Usability: Did the portal deliver a usable (Q1) well designed (Q2) business solution?*

The possibility that in spite of in-house *usability* and field testing, the project did not deliver a usable solution to adopters could not be discounted as an explanation of lack of success. Were proof-of-concept portal adoption outcomes influenced by system usability and design? In the post-trial

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<sup>179</sup> Appendix II.



interview, subjects were asked if the project had delivered a usable, well designed business solution.

In interview, *N10* praised the *design* of the portal:

I thought the design was great. I know others were impressed as well.

*N8* and *N9* similarly praised the design:

*N8*: The design was good, really good. It captured the color and light of the place.

*N9*: I thought the design was really good, very user friendly and included all the right elements.

*N6* was concerned about the *usability* of the solution, but in general comments revealed that this concern was grounded in a perception that the system needed desktop support:

I know that you explained to me how to use the system. But I needed follow up and desktop support. I am not confident with computers.

Resourcing of the proof of concept portal did not facilitate the provision of on-going desktop support and, thus, for this adopter, failure to provide such support constituted a barrier to acceptance. *N5* found the design “appropriate”, but added to the thread of *N6* by including desk top resources required by the system to the list of usability factors:

To be involved, I had to convert pictures and documents to the formats preferred by the system. Now I have the knowledge and tools to do this, but then I didn’t and that was a barrier for me.

Since the system was designed to work with Web and non-Web formats, this comment does not appear to be grounded in the functionality delivered by the system, nor does it appear to be grounded in the formal definitions of usability that have provided the basis of usability analysis in this research.<sup>180</sup> Rather, it is a comment on the training and resources available to the adopter.

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<sup>180</sup> Vide Section 2.3.4.2, p.69.

Beyond project creation, N10 did not commit to the portal because:

The portal may have drawn traffic away from my web site, which is where I want to do my E-business. There are also additional costs involved in contributing content to two sites. I only upgrade my site twice yearly because of the content and copy writing work involved.

Thus for N10, the C-commerce platform provided by the portal placed existing B2C activity at risk and involved additional cost. Unrecognized, were the potential of the portal to *increase* traffic to N10's site and to reduce content and copywriting costs through utilization of shared content.

N10 assessed the opportunity costs of committing to the portal project as high because:

Unlike N7, I don't have a mature product. My product is evolving rapidly and taking new directions, adding to the costs of site maintenance.

In summary, questions directed at assessing adopter response to solution usability and design did not suggest that these issues posed barriers to adoption. Rather, subjects were concerned with *additional costs*, whether they were *trained* appropriately, and *software* required by the system. The existing literature on CSFs in E-commerce adoption is not augmented by these factors. They can be found in both the literature on SME (Cragg and King, 1993; Darch and Lucas, 2002; Duan, Mullins, Hamblin, and Stanek, 2002; Micela, Roberti and Jacuzzi, 2002) and SMTE E-commerce adoption (Buhalis, 1996; Buhalis, 2003; Hull and Milne 2001; Nodder *et al.* 2003).

*8.3.2 Marketing: Was the portal effectively marketed to the local E-Commerce community? (Q3)*

In the post-trial interview, subjects were asked if they thought the portal solution had been effectively marketed to the community. Three weeks had been spent by portal management on adopter briefings, liaison and end-user skill development during the period December 2003 to April 2004. The discussion that follows is based on specific responses to this question, augmented by unstructured concluding comments from subjects.

N2 saw no problem with marketing of the portal solution, but identified other issues that had inhibited adoption:

The marketing was OK, but you didn't understand the culture here. Really it's a closed community. When you came here you targeted the wrong people and you didn't understand the local politics. They won't support anything that they don't *control*. If they can't control it, they are not interested.

N6, N7 and N9 had no issue with marketing of the portal and had appreciated the time and effort expended by the project team. For these subjects, barriers to adoption were to be found in the *innovative* nature of the solution and their own E-commerce *skills*:

N6: Skills are a huge issue for me. I've never done anything like this in my life. I'm struggling to use the keyboard.

N7: It was a new thing and I couldn't get my head around it. Understanding the idea was hard.

N9: It was a very new idea and I guess I wasn't equipped to deal with it. When I needed advice on E-commerce I didn't even know what questions to ask.

N2 also had a take on the problems for an adopter group, posed by an innovative solution and a lack of skills:

What you were offering was high end stuff, they had a different interest and couldn't see where it was going. A big problem here is a lack of education and training. Some operators here are in it for the lifestyle, not for a quid. They are lethargic and holding back the community. They have a fear of the unknown and new fields are a problem for them.

N5 thought the portal had been effectively marketed but that the vertical market character may have been "confusing to others." Furthermore:

You needed someone like N3 to run with it. If you had offered him money, he would have taken it up. I know he would have been receptive to that.

N8 thought the marketing was "great" but that:

I was too busy. It takes time to learn anything new that you are not familiar with. It's all time. I'm really sad that it didn't work out. It was a great idea.

N4 found that:

The initial meeting was very good, I was very enthusiastic about it. But there are lots of things to do in a small business and finding time for new things is a problem. I wasn't

able to commit to it in the end. But 'know how' was an issue for me as well. If you ask me to rate my knowledge on E-commerce at the time, I'd say 1/10.

In summary, respondents were satisfied with the promotion and marketing undertaken by the project group between late 2003 and mid 2004. Thematic analysis of the text in terms of barriers and drivers to adoption of the portal solution revisits some themes introduced in Q.1, such as *costs*, access to *resources*, *awareness*, *education* and *training*. No funds were available to employ a local coordinator as proposed by N5, and hence, the project was insufficiently *capitalized* and under *resourced* as far as one stakeholder was concerned.

N2 introduced the issue of *control* as a barrier to clustering around the collaborative shared infrastructure solution provided by the portal. In this respect, fieldwork adds to the discourse on cultural impediments to effective networking and C-commerce developed by Wilson (2002), Nodder *et al.* (2003) and Braun (2002). The embracing of collaborative tools and resources that facilitate competitive co-evolution requires the removal of attitudinal rigidities in the form of parochial world views (Braun, 2002, p.5), stubborn commitment to self-sufficiency (Wilson, 2002, p.11) and the need to control. Coupled with resource issues and costs that go with commitment to networks and other collaborative activity, Nodder *et al.* (2003, p.7) argue that cultural resistance results in low levels of collaboration and a "lack of effective networking."

*8.3.3 Impact on E-Strategy: Did my strategy for doing business online change as a consequence of the portal project (Q4)?*

In the *pre-trial interviews*, subjects were asked what role strategy played in doing business online. In the *post-trial interview* subjects were asked whether the portal had changed their approach to strategy.

#### 8.3.3.1 Pre-trial fieldwork: The role of strategy

Pre-trial interviews showed a spectrum of strategy and E-commerce expertise in the group. The top E-value creation performer was *N1*, who claimed that eighty percent of his dive business revenues were generated from E-commerce over the Web. With his management team, *N1* regularly reviewed and evaluated web log data describing referrer sites, domains by country, search engine keywords used and other system generated metrics that might be used to develop and review online marketing strategy and performance. *N1* was convinced of the relative value of business *strategy* compared with the 'bells and whistles' of elaborate sites:

I figured out early on that divers are sophisticated technology users and that their use of the Internet for sharing experience, knowledge and destination planning would only grow. I was probably the first here to understand the real importance of the Web and how it would change everything. But the others are catching up. Metrics and analysis are more important than 'bells and whistles' which a lot of people don't understand. I did a major upgrade of our site when we changed our service provider. It didn't work and we went back to our old provider and our original site. The strategy stuff is more important.

The pre-trial interview concluded with a discussion of Google's PageRank and the Google Search Engine. The Google Toolbar was installed on *N1*'s machine, and the PageRank of *N1*'s Web site was measured. The significance of PageRank and strategies for improving PageRank concluded the discussion. *N1* was satisfied with the outcome:

You showed me how to measure my current [Page] rank and gave me something to aim for. I've got a new metric to work with and we've set a benchmark for my business.

*N1* displayed *E-intelligence*, the capability of using Web intelligence extracted from server logs and other sources to develop E-strategy. The cognitive foundations of this skill were expanding to encompass new knowledge that could be used to refine strategy. In terms of E-commerce (Engsbo *et al.* 2001) strategy was framed both as an *opportunity* and a *necessity*.

N2 operated an accommodation business. N2 had proven a consistent and enthusiastic advocate of the portal project from its inception. N2 represented and championed the project to the local business community, including negotiations with the local Chamber of Commerce. In the pre-trial assessment, N2 ranked third in the pilot group in terms of E-revenues and was already deriving thirty percent of total revenues from the Web channel. However, he was not satisfied that he understood E-strategy or was leveraging as effectively as he might from the Web. At the time of the pre-trial interview, N2 saw the future of his business as bound up with the forging of a strategic alliance with a major international hotel chain. For N2 such a business alliance would bring the advantages of brand recognition, while enabling N2 to run his business more or less autonomously. N2's awareness of the importance of strategy for doing business online was established, but knowledge acquisition and strategy development and implementation were in their infancy:

I've gone through the establishment phase with this business and now I am looking very closely at online. But I've got a lot to learn. I haven't done any web log analysis so far, so I'm not quite there with strategy. But the message isn't wasted on me. Some people around here are doing very well out of the Internet. Look at N10, all of his business is low cost consumer direct based on his web site. My goal is to position myself like that, to increase the importance of consumer direct in the revenue mix. You can lose anything up to 30 to 40% working through retailers.

Other pre-trial interviews showed that awareness of the importance of E-strategy was not uniform. Node N6, a partner in a tour based business specializing in safari tours, was struggling with many foundation concepts and practices in E-commerce, including E-strategy and E-intelligence:

I guess we don't really have a strategy like some other businesses do. I don't understand referrer logs and we don't use the log files. I know they are there. But I've never used them. Whenever I need to know or do something I ask N3.

N6 expressed disappointment in the performance of the Web channel, which he reckoned to be delivering only five percent of the firm's total revenues. N4 who operated another adventure tourism business, was also disenchanted

with E-commerce on the Web, similarly estimating online revenues as a percentage of total revenues at around five percent. In common with N6, no Web log analysis had been undertaken and no documented strategy for E-commerce existed:

If I had to tell you what I know about the Web, I'd give myself 1/10. Acquiring these skills is a challenge for me. There are not enough hours in the day.

Nonetheless, N4 could see potential in the portal project. But this enthusiasm was grounded more in the concept of *electronic agora*, than E-commerce potential:

I can see huge potential for this. I'd like to use it for our sea kayak trail campaign. I can see a forum and project library of key documents. It would help people to understand what we are on about and help with resolution of planning issues.

N3 a self taught local Web design consultant, who had worked for both N4 and N6, was less sanguine about the project, uncomfortable with its implications and fatalistic about the march of technology:

Solutions like yours reduce opportunities for people like me. But I guess it was inevitable that things would move in this direction, that's technology. I can see the advantages that databases bring, and maybe it's the way of the future.

Despondency with the Web channel was also characteristic of N7 who reckoned in pre-trial interview that less than two percent of his firm's total revenues could be attributed to the Web channel. N7 had abandoned the E-shop business model:

I ran a Web site, but I don't anymore. It was costing me more than I was making. You can forget about strategy and that kind of stuff. I know what you are talking about, but you see my market is based on an older demographic. In this market, Internet skills are not common, so I get more out of advertising, the Visitor Centre and word of mouth. Maybe it'll change but that's the way it is for me, right now.

N7 had converted to a portal/directory only strategy, which had eliminated site hosting and maintenance costs.

8.3.3.2 Post-trial interview: Impact of the portal and evolution of E-strategy

In the portal adopter group, the contrast between pre-trial and post-trial attitudes to strategy was greatest with N2 who had championed the portal project in the local community. N2 was enthusiastic and equal to the challenge posed by E-strategy:

I did a major review of my online strategy with N12 about 6 months ago. He introduced me to Web analytics and we looked at search engine keywords and found that my site was not search engine friendly. We've made changes and I'm now number one on Yahoo. I'm really just starting on this stuff. My online business is growing and I'm getting more low cost online retail business through spot market accommodation provider *Wotif*. In the retail mix, the share of traditional travel agents is shrinking. I'm also getting more consumer direct business now that I have introduced a booking engine on my site. There are a few things that need sorting out with it, but it's looking promising at the moment.

Observation of N2's E-commerce Web site showed that N2 was prepared to learn from the C-commerce platform and *imitate* core functionality and strategy. N2's site was upgraded twice during the trial period, both upgrades involving core functionality changes. The first upgrade introduced virtual community and interactive multimedia, both features of the portal C-commerce solution. The second upgrade extended database integration (another feature of the C-commerce solution), added extranet services for corporate clients and customers and an enhanced guest book. The earlier virtual community forums were discarded as part of the second phase of re-development. As a consequence of these enhancements, a superior transformation site with back-end office integration and enhanced customer relations functionality had been achieved. In concluding remarks in the post trial interview, N2 reflected on his growing status as a best practice mentor in the local E-commerce community:

I try to lead by example. My business is currently expanding while many others are not. I try to help, but example is not enough.



In contrast, *N6* declared that there had been no strategy changes since the pre-trial interview. While the portal was interesting it had not caused any rethink of strategy. Online revenues and sales leads had improved “a bit” since 2003, but no changes had been made in the use of strategy or metrics, and *N6* was unsure of the reason. Observations made of *N6*’s E-commerce Web site showed no changes in graphic design or functionality during or after the trial period.

*N6* had an established business relationship with *N3*, a local Web site designer. *N3* was the business solution provider responsible for construction and maintenance of *N6*’s web site. Three other adopters, *N4*, *N9* and *N5* were connected with *N3*, through Web site consultancy and/or the provision of desk-top support. *N3* was a widely respected entrepreneurial figure in the local community. *N5* referred to *N3* as a “local legend” and technically gifted individual who had made the transition from dive tour operator and camera man to Web site and multimedia design. A dissenting view about the role of strategy had been displayed by *N3*, in the pre-trial interview. This view was confirmed in the post-trial interview, where *multimedia* was rated more important:

Sure strategy is important, but not as much as many people think. You can waste a lot of time and money on improving your search engine ranking. When you think you have cracked it, the rules change, and you are back where you started. I tell my clients that beautiful pictures and text is what works, bright and colorful pictures that tell a thousand words. Not flash things that whiz around, just beautiful pictures with text. It’s the multimedia that brings them here. You can connect effectively with your customer just by making sure that you have links to your Web sites on the major industry portals and directories. Let them worry about search engine rankings.

Inspection of *N3*’s web site provided further evidence of *N3*’s commitment to vividness and the role of the self-taught entrepreneur. In company details, *N3* declared:

No wall certificates, no classes and self taught. IT has to be bright and beautiful.

In the post trial interview, N3 would not be drawn on questions that related to the design, usability, marketing or impact made by the portal. Openness and anxiety about the pace of technology development had given way to disinterest and reticence to discuss the project:

I didn't spend much time on it. I wasn't interested. I know that must be disappointing to you, but if it doesn't engage me, I don't waste time on it.

In the post trial interview N7, declared his intention to embark on a new ecotourism venture and make a new beginning on E-commerce. Reflecting on his personal history in E-commerce, he admitted a lack of understanding of the importance of strategy:

If you want me to describe what our approach has been to E-business in the past, I'd say 'hit and miss.' When I operated my own site I didn't have a strategy. I've never used consultants or anything like that. Now that I'm starting a new business, I'm thinking about the Google rank and I know that there is more to it than the site itself. But I haven't got a clue about search engines. You have to pay to get a good rank don't you?

Disappointment with the Web channel had led N7 to abandon his own Web site in favour of portals and directories:

When you first spoke to me I was dubious about the value of the Web. Our business at the time was built around an older demographic and I was very disappointed in the returns from my site. So I gave up on it.

N9 was also experiencing difficulty with the formation of online strategy and in the post trial interview admitted that by the end of 2003:

I was at a standstill with our web site. I didn't know where to go. I didn't know then what I know now. Now I know about optimization and how important that is. Back then, when I needed advice on E-commerce I didn't even know what questions to ask. It's like going to an accountant. To get the information you need, you have to know what questions to ask.

#### 8.3.4 Conclusions on E-strategy

Reference to E-value creation data showed that interview subjects with superior E-value creation outcomes<sup>181</sup> employed E-strategy. They also displayed E-intelligence in the use and application of web metrics, the role of log analysis and SEO. Subjects with no strategy for doing business online, who made no use of web metrics, performed no log analysis and did not pursue or understand SEO, recorded inferior outcomes.<sup>182</sup> Thus, interview data provided qualitative confirmation of the importance of E-strategy, a finding from the empirical study. Firms in the quasi-experiment group with established or developing expertise in E-strategy and E-intelligence were more satisfied with their performance online, than firms that were struggling with strategy.

Firms with superior E-commerce value creation outcomes also operated superior Cyber transformation E-commerce web sites. By the conclusion of the field trial, *N2's* site architecture had evolved to incorporate DBMS, providing the basis of back-end office integration. In December 2004, when data gathering for network analysis was undertaken, the site had further evolved to encompass *extranet* capabilities enabling customized user views and access to extranet sources. *N10's* Web site made extensive use of Flash and multimedia that focused on the experiential dimension of ecotourism, with selective support for simulation. In comparison, *N1* operated a predominantly static Web site, but with rich video support, providing an experiential dimension to the online experience.

Impact of the proof of concept portal on E-strategy was evident with *N2*, who adopted virtual community as an element of his own E-strategy, i.e., *imitated* functionality found on the site. *N2* also flirted with online alliances, another

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<sup>181</sup> *N1, N2 and N10.*

<sup>182</sup> *N4, N5, N6, N7, N8 & N9.*

element of strategy introduced by the portal. Insignificant or no impact on strategy was evident in the remainder of the portal adopter group. More generally, while some firms had made progress on E-strategy, most had made none. N4 felt that as a consequence of review in late 2003, he was at last coming to grips with this important subject:

When I first spoke to you, I was frustrated with the returns on my web site. It wasn't until 2003 that I was able to employ someone with Web skills and then we did a comprehensive review of all the strategy stuff - meta-tagging, keywords, search engine optimization. That brought about improvement in my online business outcomes, but I have further to go. I've got a database driven Web site which is ready to go, but not yet implemented.

However, N6, N7 and N9 remained fundamentally challenged by the concept of strategy, manifesting problems of awareness and understanding that precluded its articulation in business practice.

In surveying the interview and E-value creation data, it was clear that three firms in the adopter group, N1, N2 and N10 were sophisticated users of strategy, but *knowledge diffusion* of core competencies in strategy development and implementation was not operating outside the group. The research literature contains references to the ineffectiveness of SME networking (Nodder *et al.* 2003; Wilson, 2002; Braun, 2002; Brown, 2000) and its consequences for E-commerce, and latterly C-commerce. The finding suggests nothing new, and it is easy to gloss over what is already the subject of substantial commentary. However, the data were suggesting an obvious elite clique (consisting of N1, N2 and N10) and ego-centric influences (N3) in information and knowledge flows in the adopter group that deserved closer attention. The methods of SNA were deemed most appropriate to explore this problem and its relationship with portal adoption outcomes. Network analysis follows this discussion of fieldwork outcomes.

*8.3.5 Alliances and partnering: Did my attitude toward co-operating with other firms change as a consequence of the portal project (Q5)?*

In pre-trial interview, subjects were asked about the nature and extent of co-operation with other firms online. In the post-trial interview, subjects were asked if their position on co-operation had changed since the pre-trial interview either as a consequence of their involvement with the portal project or for other reasons.

In pre-trial fieldwork all subjects had agreed that some form of co-operation was necessary between operators because, as N6 put it:

N6: We all share an interest in getting people to the region. Once they are here, we can compete with each other for their business.

However, observations of subject Web sites made concurrently with fieldwork showed no evidence of online partnerships in advertising, and only two sites that supported reciprocal links. Beyond the shared need to bring visitors to the region, the evidence of co-operation between firms was minimal. N2 lauded the goal of co-operation, but in practice found co-operation was “a source of local strife” and often “fell foul of local politics.”

In post trial fieldwork, observation revealed changes to N2's web site involving the addition of home page links to other local businesses. Was this evidence of online partnering?

I put it on for political reasons. It doesn't mean anything in terms of my online strategy.

In interview, N10 had estimated consumer direct revenues from his Flash enhanced web site at around 30% of total revenues. With N1 and N2, N10 formed the E-commerce elite clique in the adopter group. Had N10 changed his position on online partnering?

I'm still sharing links with local businesses. But that's it, there are no buyer seller business relationships locally that would cause me to take it any further.

Thus, as measured by observation and interview data, online partnering had not progressed since the pre-trial interview and no change of attitude was reported as a consequence of the portal initiative.

#### 8.3.6 Conclusion: Online partnering and alliances

Fieldwork in the form of interviews and observational data showed low levels of online co-operation between firms in the portal group. Post-trial interviews and observation data revealed that the C-commerce opportunities provided by the portal had not prompted any change in attitude towards inter-firm co-operation and partnering. Even within the elite group, no resolve appeared to exist on co-operation or competitive co-evolution. *N10* who had commended the proof of concept portal not only in terms of design and usability, but also conceptually, was keen in post-trial interview to identify a *threat* arising from the collaborative platform:

*N10*: The portal may have drawn traffic away from my web site, which is where I want to do my E-business.

The commitment given by adopters in portal stakeholder consultations to the C-commerce platform can therefore be regarded as an aberration. In circumstances where members of the adopter group were not receptive to the message of C-commerce, prospects for the portal were grim, regardless of the delivery of a resource advantage (mobile data integration), not available to firms acting outside the co-operative environment. Low levels of inter-firm co-operation were partly grounded in the *distrust* operators displayed toward each other and co-operative decision making processes. For *N2*, decision making had been driven by self-interest that placed clear obstacles to innovation:

N2: The business community here is working to delay development, maintain monopoly and resist innovation.

A clear conclusion from fieldwork was that low priority had been placed on alliances and partnering by members of the adopter group. Rather E-commerce culture emphasized *autonomy* and *competition* at the expense of competitive co-evolution. Reasons for this low priority included skepticism about processes and outcomes from co-operative activities more generally and low levels of E-commerce awareness, knowledge and competency. Citing Tetteh and Burn (2001), Rowe (2004, p.365) concludes that to seize the opportunity of C-commerce, SMEs require:

strategic thinking, trust and a realisation of the importance of co-opting rather than competition which typically exists amongst individual firms.

In the elite group that was capable of 'strategic thinking', the success enjoyed on the basis of the current E-shop model also worked against adoption of the C-commerce platform. Since E-commerce revenues were growing, no compelling reasons existed for change and the embrace of clustering. In businesses with inferior outcomes, where resolve for change ought to have existed, the project was equally unsuccessful in changing what Braun (2002, p.5) describes as the "domain actors parochial world view." How could this be? Fieldwork and the literature provide insights into this problem in terms of the familiar factors of:

- Education and training in Technology and Management (Cragg and King, 1993; Darch and Lucas, 2002; Duan, Mullins, Hamblin, and Stanek, 2002; Micela, Roberti and Jacuzzi, 2002);<sup>183</sup>
- Technology/Applications and Hardware/Software (Lewis and Cockrill, 2002; Walker, Bode, Burn, and Webster, 2003);<sup>184</sup>

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<sup>183</sup> Vide Section 8.3.1, p.313.

- Awareness and Understanding/Access/Affordability (Mehrtens, Cragg, & Mills, 2001; Walker, Bode, Burn, and Webster, 2003);<sup>185</sup>
- Business Analysis and Planning readiness including strategy formation (Chau, 2003; Scupola, 2002, Buhalis, 1996; Buhalis, 2003)<sup>186</sup> and;
- Culture (Hull and Milne 2001; Wilson, 2002; Nodder *et al.* 2003; Braun, 2003).<sup>187</sup>

In search of new insight, analysis turned to the fields of social and knowledge network analysis.

#### 8.4. Network analysis: The portal adopter group

##### 8.4.1 Analysis overview

The *Literature Review* discussed work by Uzzi (1996), Rogers (1995) and Freeman (1991) that suggested the role of social networks and nodes within networks in shaping economic performance and response to innovation.<sup>188</sup> In her Grampians study, Braun (2003) employed a *descriptive, interpretivist* approach to understanding SMTE networks based on *observations* of the *character* of relations between nodes and perceived barriers to clustering. As *Chapter Five* explains more is on offer in terms of analysis methods (Scott, 1991, Rogers, 1995, Breiger, 2004; Valente, 2004; Hanneman, 2001) and the current study employs methods that combine both *quantitative* and *interpretivist* approaches to the analysis of *sociometric* data.

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<sup>184</sup> *Ibid.*

<sup>185</sup> Vide Section, p.8.3.2, p.317.

<sup>186</sup> Analysis of interview data showed that appreciation of the role of strategy and strategy formation was not consistent in the adopter group. Vide Section, 8.3.3 p.317.

<sup>187</sup> Vide Section 8.3.2, p.316.

<sup>188</sup> Vide Section 2.1.10, p.46.



The portal quasi-experiment introduced a C-commerce type innovation with advanced Cyber transformation functionality to an existing regional E-commerce community. Thus, the portal quasi-experiment provided an opportunity to investigate the role of social networks as a CSF in the adoption of innovative, shared infrastructure solutions in an SMTE industry setting.

Data gathered forming the data set for network analysis, describes interactions during the six month trial period in which the portal was in operation and concerns the local area network of portal adopters, Web consultants and advisors. Two social network analysis packages were used to analyze ties and other facets of network topology:- *Ucinet for Windows* v.6.86<sup>189</sup> and *Netdraw* v2.1.<sup>190</sup>. Huisman and Van Duijn (2005, p.275) refer to UCINET as “the best known and most frequently used software package for the analysis of social network data.” Results from analysis are organized by tie type and incorporate standard analysis techniques such as analysis of isolates, centrality, degrees et cetera. Ties used in data gathering and subsequent analysis are primarily based on work done on learning networks by Borgatti and Cross (2003).<sup>191</sup>

Review of tie data suggests that nodes in the adopter network were not connected in a *formal* knowledge network of the kind found in the mainstream C-commerce literature (e.g., Apostolou *et al.* 2005). The *informal* character of the network is revealed in summary statistics describing Tie (*i*) data, e.g., the small number of information requests recorded over the portal trial period. The pattern shown may be characteristic of SME networks (Braun, 2003; Pavlovich, 2003), but the question is not specifically investigated. Low nodal density and interaction frequency are certainly consistent with the observation

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<sup>189</sup> Borgatti, S.P., Everett, M.G. and Freeman, L.C. (2002). *Ucinet for Windows: Software for Social Network Analysis*. Harvard, MA. Analytic Technologies.

<sup>190</sup> Borgatti, S.P. 2002. *NetDraw: Graph Visualization Software*. Harvard. Analytic Technologies.

<sup>191</sup> Vide Section 5.7.1, p.183.

of 'stubborn self sufficiency' (Nodder *et al.* 2003) and other cultural impediments to collaboration (Pavlovich, 2003; Braun, 2003).

In order of presentation, the analysis presents:

- Analysis by Tie type;
- Matrix Analysis of single and compound relations; and
- Reflections on topology, centrality and other network attributes.

#### 8.4.2 Analysis: Ties and network topology

Both local and wide area network analysis was undertaken. The analysis begins with the analysis of tie data collected for the local area network.

##### 8.4.2.1 Knowledge: Tie (*k*)

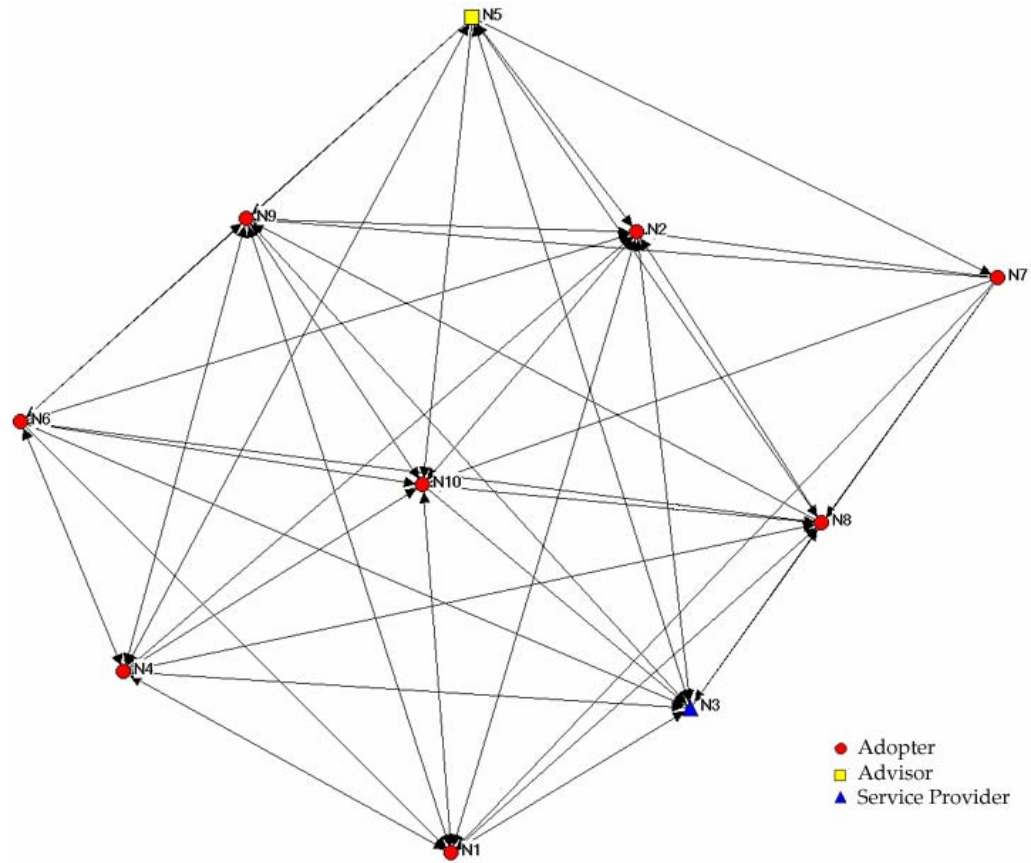
Summary statistics for the Tie (*k*) matrix are described in Table 8.5:

Table 8.5 Summary Statistics Tie ( <i>k</i> )	
Mean	0.776
Std. Dev.	0.417
Sum	59.000
Variance	0.174
Minimum	0.000
Maximum	1.000
N of Obs.	76

Seventy six percent of nodes<sup>192</sup> were attributed knowledge or no knowledge by other nodes, describing a network where 76% of individuals are known to each other and nodes possess confidence in their ability to attribute knowledge or no-knowledge. The mean strength across directed ties (the matrix density) was 0.776, i.e., 77.6% of nodes attributed knowledge or no knowledge are considered to have knowledge of E-commerce by other nodes.

<sup>192</sup> N of Obs./N of possible Obs.

Figure 8.3 describes a *Netdraw* view of *directed* knowledge ties in the portal group. The diagram depicts (as directed ties) nodes considered by other nodes to have E-commerce knowledge.



**Figure 8.3 Tie ( $k$ ) in the portal group: *Netdraw* view**

Table 8.6 describes directed ties by rows. Mean  $k$  ties for  $N2$  and  $N10$  suggest that these nodes display low confidence levels in the E-commerce knowledge held by other nodes in the local area network. Inspection of E-value creation data reveals these nodes to be members of the elite cohort<sup>193</sup> with B2C revenues of 30% or better of total revenues. Conversely, under-performers<sup>194</sup> in terms of E-value creation are *less* discriminating in attributing E-commerce knowledge to other nodes.

<sup>193</sup>  $N1$ ,  $N2$  and  $N10$ .

<sup>194</sup>  $N4$ ,  $N6$ ,  $N7$ ,  $N8$ ,  $N9$ .

Table 8.6 Summary statistics: Tie ( <i>k</i> ) by rows				
	Mean	Std. Dev.	Sum	Var.
N1	0.667	0.471	6.000	0.222
N2	0.333	0.471	3.000	0.222
N3	0.857	0.350	6.000	0.122
N4	1.000	0.000	8.000	0.000
N5	1.000	0.000	8.000	0.000
N6	0.875	0.331	7.000	0.109
N7	1.000	0.000	6.000	0.000
N8	1.000	0.000	7.000	0.000
N9	0.833	0.373	5.000	0.139
N10	0.375	0.484	3.000	0.234

Inspection of aggregate *column* data, as measured by directed tie (*k*) data, shows the extent to which nodes are recognized by other nodes as repositories of E-commerce knowledge. Table 8.7 shows the summary data:

Table 8.7 Summary statistics Tie ( <i>k</i> ) by cols.				
	Mean	Std. Dev.	Sum	Var.
N1	1.000	0.000	8.000	0.000
N2	1.000	0.000	9.000	0.000
N3	1.000	0.000	9.000	0.000
N4	0.833	0.373	5.000	0.139
N5	0.500	0.500	3.000	0.250
N6	0.375	0.484	3.000	0.234
N7	0.200	0.400	1.000	0.160
N8	0.750	0.433	6.000	0.188
N9	0.778	0.416	7.000	0.173
N10	1.000	0.000	8.000	0.000

The Mean and Sum values show that nodes *N1*, *N2*, *N3* and *N10* are authoritative in terms of the network. Std. Dev. for these nodes displays low or no variability, meaning that the perception of *N1*, *N2*, *N3* and *N10* as knowledgeable is normative. *N7* has least recognition as a knowledgeable

source on E-commerce and other under-performing nodes in terms of E-value creation, such as *N6*, *N4* also display inferior Mean and Sum values. There is also greater variability in how these nodes are perceived as measured by Std. Dev. values. Correlation between E-commerce value creation data and Tie (*k*) data suggests no information externality in terms of nodal recognition of where expertise in E-commerce exists in the network. The extent to which nodal recognition of E-commerce expertise is reciprocated, is described by the Matrix Reciprocity Value (MRV). Hybrid reciprocity for Tie (*k*) was measured at 40.48%, describing a situation where less than half of the nodes in the network enjoy reciprocal recognition.

#### 8.4.2.2 Interaction: Tie (*i*)

If the repositories of knowledge are mostly known, what does the analysis of information exchange say of power and influence? Summary statistics for the Tie (*i*) matrix are described in Table 8.8:

Table 8.8 Summary Statistics: Tie ( <i>i</i> )	
Mean	0.500
Std. Dev.	1.766
Sum	38.000
Variance	3.118
Minimum	0.000
Maximum	12.000
N of Obs.	76

The data describe low levels of interaction corresponding to *weak ties* (Granovetter, 1973) and considerable variation in activity levels. Some nodes record no out-ties, an indicator that the local area E-commerce network is not a preferred source of domain knowledge. Investigation of the data columnwise, shows a pattern of sink (Hanneman, 2001, p.43) behaviour, i.e., nodes in the network that are the target of directed interaction ties. Table 8.9 describes the summary statistics:

Table 8.9 Summary statistics: Tie (i) by cols.				
	Mean	Std. Dev.	Sum	Var.
N1	0.000	0.000	0.000	0.000
N2	0.333	0.943	3.000	0.889
N3	3.333	3.859	30.000	14.889
N4	0.000	0.000	0.000	0.000
N5	0.333	0.745	2.000	0.556
N6	0.000	0.000	0.000	0.000
N7	0.000	0.000	0.000	0.000
N8	0.000	0.000	0.000	0.000
N9	0.000	0.000	0.000	0.000
N10	0.375	0.992	3.000	0.984

The data show that *N3* has the largest *InDegree* score and far exceeds any other node as a recipient of directed interaction ties. While *N1*, *N2* and *N10* were widely regarded as possessing E-commerce knowledge as measured by Tie (*k*) column analysis, recognition has not translated into information and knowledge seeking behaviour in the network. A further observation from Tie (*i*) analysis, concerns the under performers *N4*, *N6*, *N7* and *N9*. These nodes record no incidences of directed ties, suggesting their inexpert status is understood in the network.

With the aid of Netdraw *directed* interaction ties in the portal group can be visualized. Figure 8.4 provides this view. Tie strength, as measured by the number of directed E-commerce information requests, is shown by *line thickness*. The centrality of *N3* is clear. This view also shows the predominantly asymmetric character of the network, visible in the small number of reciprocal ties. The network topology is also characterized by non-closure involving clear *isolates* (*N1* and *N7*). As measured by information and knowledge flows, influence in the network is clearly vested in *N3*, as measured by the number of asymmetric directed ties and tie strength.

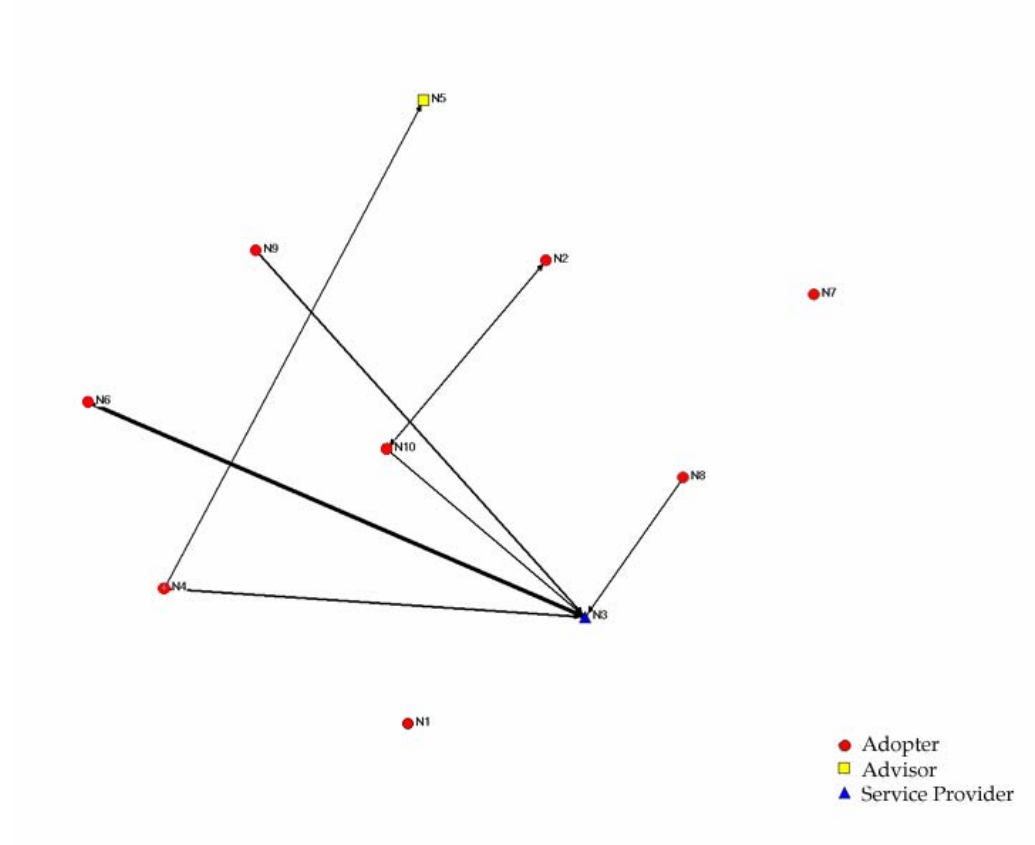


Figure 8.4 Tie (i) in the portal group: *Netdraw* view

Social capital (Coleman, 2003, p.59) consists of ‘aspects of social structure’ that facilitate certain ‘actions by actors’ within the structure, such as adoption of an innovation. In discussion of social structure that facilitates various kinds of social capital, Coleman (2003, p.66) describes the implications of non-closure for the development of effective norms. Three findings from Coleman’s work (*ibid*, p. 68) appear important in terms of the generation of social capital on behalf of the portal project. Namely, non-closure:

- inhibits the “proliferation of obligations and expectations.” In the absence of a normative position amongst peers, no sanctions can be used to ensure commitment;
- poses a barrier to the development of reputation on behalf of the project and its champion(s); and

- inhibits development of a condition of *trustworthiness*, seen as essential for C-commerce (Morgan and Hunt, 1994; Robbins, 2003; Rowe, 2004).

Tie analysis of interaction, also demonstrates the critical role played by N3. With dichotomous recoding of Tie (*i*) data to show presence or absence of dyads, the central role of N3 can plainly be seen:

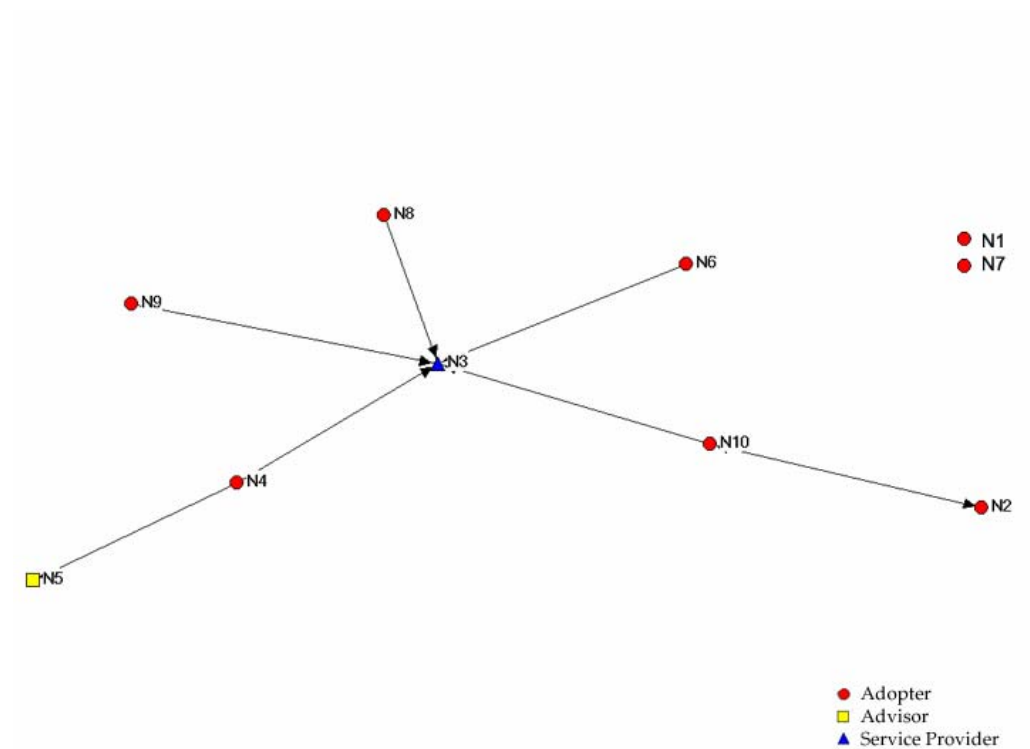


Figure 8.5 Dyadic relationships in the portal group: *Netdraw* view

Geodesic distance describes the minimum distance between nodes (Hanneman, 2001, p.57). The average distance among reachable pairs is 1.111. The diameter of the network as measured by the largest geodesic distance is 2.000, i.e., no node is more than two steps from any other node. Geodesic distance data suggests that information and knowledge flows rapidly through the connected parts of the network.



Dyads can be reciprocal or uni-directional. The Matrix Reciprocity Value (MRV) provides a measure of the extent to which ties are reciprocal or uni-directional. *Ucinet* calculates the dyad-based reciprocity<sup>195</sup> in the Portal Group at 14.29%, i.e., the overwhelming majority of dyads are uni-directional describing a very *hierarchical, unbalanced* network.

#### 8.4.2.3 Trust: Tie (*t*)

Tie analysis in section 8.4.2.2 showed that Tie (*i*) activity did not follow E-commerce operational excellence as measured by E-commerce value creation. Top E-commerce performers such as *N1*, *N2* and *N10* were the subject of modest directed tie activity. Further, reference to the topology diagram Figure 8.4 shows that this activity occurs within the elite group. Why do under performers, not look to their more experienced and successful peers for information and knowledge? Tie analysis of trust in the network illuminates this problem. Table 8.10 describes summary statistics for Tie (*t*):

Table 8.10 Summary Statistics: Tie ( <i>t</i> )	
Mean	0.526
Std. Dev.	0.499
Sum	40.000
Variance	0.249
Minimum	0.000
Maximum	1.000
N of Obs.	76

Mean and Std. Dev. show *distrust* and *trust* are about as common in the data set and that considerable variance exists. Analysis of row data shows how nodes view the trustworthiness of other nodes in the network. Table 8.11 shows the row data:

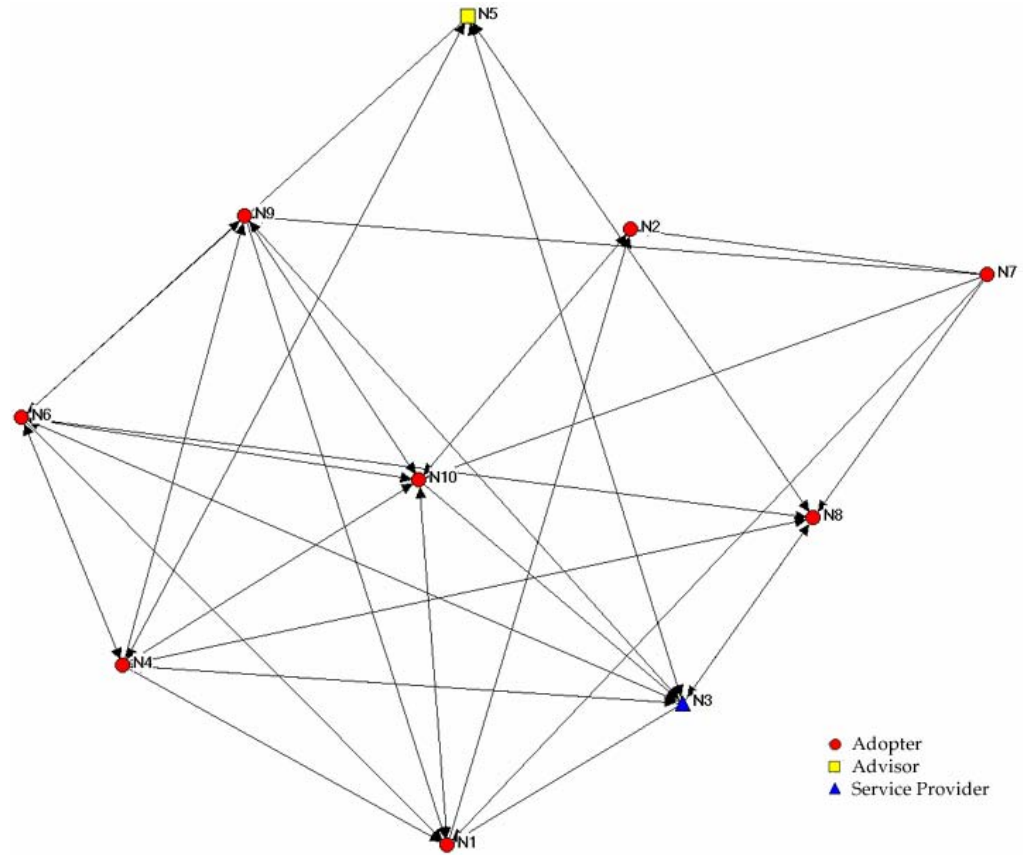
<sup>195</sup>  $\text{Num}(X_{ij}>0 \text{ and } X_{ji}>0) / \text{Num}(X_{ij}>0 \text{ or } X_{ji}>0)$

Table 8.11 Summary statistics Tie ( <i>t</i> ) by rows				
	Mean	Std. Dev.	Sum	Var.
N1	0.222	0.416	2.000	0.173
N2	0.111	0.314	1.000	0.099
N3	0.857	0.350	6.000	0.122
N4	0.875	0.331	7.000	0.109
N5	0.500	0.500	4.000	0.250
N6	0.750	0.433	6.000	0.188
N7	0.833	0.373	5.000	0.139
N8	0.429	0.495	3.000	0.245
N9	0.500	0.500	3.000	0.250
N10	0.375	0.484	3.000	0.234

Mean and Std. Dev. for *N1*, *N2* and *N10* show that these nodes predominantly view other nodes in the network as untrustworthy sources of E-commerce knowledge. Thus, whilst these nodes are to a lesser (*N2*) or greater extent (*N1* and *N10*) prepared to concede that E-commerce knowledge exists elsewhere in the network,<sup>196</sup> the trustworthiness of this knowledge is assessed as low. As the *Netdraw* diagram in Figure 8.6 shows, reciprocity exists in the elite sub group consisting of *N1*, *N2* and *N10*, but only one directed tie (*t*) exists outside this faction from *N10* to *N3*.

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<sup>196</sup> Vide Section 8.4.2.1, p.331.



**Figure 8.6 Tie ( $t$ ) in the portal group: Netdraw view**

Conversely, under performers ( $N4$ ,  $N6$ ,  $N7$ ,  $N8$  and  $N9$ ) are more trusting, although variability is greater in the cases of  $N8$  and  $N9$ . Inspection of the data columnwise, shows that  $N1$ ,  $N3$  and  $N10$  are the most trusted nodes in the network in terms of directed trust ties, as measured by Mean and Sum values. The portal champion,  $N2$ , enjoys *few* directed trust ties and  $N7$  is not trusted by anyone in the group. Table 8.12 shows the columnwise data:

Table 8.12 Summary statistics: Tie ( <i>t</i> ) by cols.				
	Mean	Std. Dev.	Sum	Var.
N1	0.750	0.433	6.000	0.188
N2	0.333	0.471	3.000	0.222
N3	0.667	0.471	6.000	0.222
N4	0.500	0.500	3.000	0.250
N5	0.500	0.500	3.000	0.250
N6	0.500	0.500	4.000	0.250
N7	0.000	0.000	0.000	0.000
N8	0.625	0.484	5.000	0.234
N9	0.444	0.497	4.000	0.247
N10	0.750	0.433	6.000	0.188

The MRV value provides a measure of the extent to which dyads are reciprocal or uni-directional. Dyad based reciprocity was measured at 0.3793, meaning that only 37.93% of all nodes, or slightly better than one third of nodes trust each other.

#### 8.4.2.4 Value: Tie (*v*)

In a reliable data set, Tie (*v*) column data was expected, *a priori*, to show significant correlation with Tie (*t*) column data. Information and knowledge flows from trusted sources in the network are valued more highly by nodes than flows emanating from *untrusted* sources. Tie (*v*) data were found not to be normally distributed, suggesting that a non-parametric test should be used in any test for data reliability. A 1-Tailed test with Spearmen's Rho showed *highly* significant positive association between Tie (*v*) and Tie (*t*) data ( $p = .001$ ) and strong association as measured by the correlation coefficient ( $r=0.863$ ). Thus, it was concluded that the data were reliable. Table 8.13 describes summary statistics for Tie (*v*):

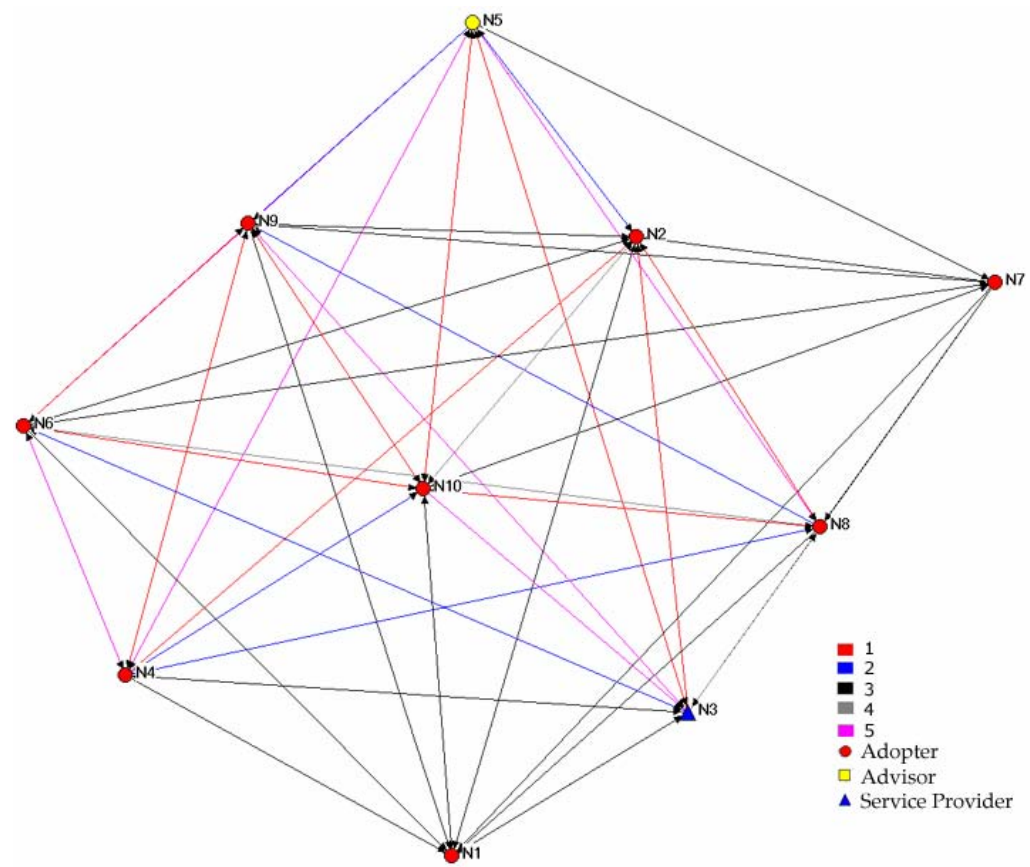
Table 8.13 Summary Statistics Tie ( <i>v</i> )	
Mean	2.592
Std. Dev.	1.397
Sum	197.000
Variance	1.952
Minimum	1.000
Maximum	5.000
N of Obs.	76

The Mean (2.592) is located below the scale mid point (3.000), a finding consistent with analysis of Tie (*t*) data. Std. Dev. (1.397) shows variability in the value attached to information and knowledge flows emanating from nodes in the network.

Table 8.12 Summary statistics: Tie ( <i>v</i> ) by cols.				
	Mean	Std. Dev.	Sum	Var.
N1	3.250	0.661	26.000	0.438
N2	2.444	1.165	22.000	1.358
N3	3.222	1.548	29.000	2.395
N4	2.667	1.795	16.000	3.222
N5	2.500	1.607	15.000	2.583
N6	2.375	1.576	19.000	2.484
N7	1.200	0.400	6.000	0.160
N8	2.625	1.654	21.000	2.734
N9	2.111	0.994	19.000	0.988
N10	3.000	0.707	24.000	0.500

As measured by directed Tie (*v*) data, nodes *N3*, *N1* and *N10* are most recognized in terms of the value attached by other nodes to the information and knowledge they possess. The pattern is consistent with the superior E-commerce value creation outcomes recorded by nodes *N1* and *N10* and the centrality displayed by *N3* in the network subset of E-commerce under performers. Figure 8.7 shows a *Netdraw* view of the data, inclusive of tie

direction and strength represented by line color. This view is inclusive of isolates *N1* and *N7*:



**Figure 8.7 Tie (*v*) in the portal group: Netdraw view**

Tie strength increases with nominal scale values. The diagram shows that project champion *N2*, is the subject of a strong directed value tie from within the elite faction in terms of E-value creation (*N10*), but tie strength in the faction of weak performers contains more directed weak ties (*N3*, *N4*, *N5* and *N8*) than strong ones. Comparison of *Tie (v)* data with *Tie (i)* data shows that while *N1* is the recipient of strong directed value ties describing awareness in the group of *N1*'s expertise, there is no interaction with other nodes in the network, i.e., *N1* is an isolate.

#### 8.4.2.5 Accessibility: Tie (a)

The information and knowledge recognized in a node by the network represents social capital only if it is *accessible* to other nodes. In the portal quasi-experimental group, some nodes are more accessible in the network than others. For example, node *N4* is the least accessible node in the group as measured by columnwise analysis, an outcome attributable to the seasonal character of *N4*'s business and regular absence from the Cape Range Ningaloo region. Table 8.13 describes the summary statistics.

Table 8.13 Summary Statistics Tie (a)	
Mean	3.605
Std. Dev.	1.171
Sum	274.000
Variance	1.370
Minimum	1.000
Maximum	5.000
N of Obs.	76

On the nominal scale of 1 to 5, where 1 represents very low accessibility and 5 represents very high accessibility, the Mean value (3.605) suggests good accessibility across the network. However, there is some variability in the data as measured by Std. Dev. Table 8.12 describes the columnwise analysis of directed access dyads.

Table 8.12 Summary statistics: Tie ( <i>a</i> ) by cols.				
	Mean	Std. Dev.	Sum	Var.
N1	3.750	1.639	30.000	2.688
N2	4.000	0.816	36.000	0.667
N3	3.556	1.066	32.000	1.136
N4	2.500	0.500	15.000	0.250
N5	3.833	1.067	23.000	1.139
N6	4.000	1.000	32.000	1.000
N7	4.000	1.265	20.000	1.600
N8	3.375	1.111	27.000	1.234
N9	3.444	1.066	31.000	1.136
N10	3.500	1.118	28.000	1.250

Tie (*a*) data describes only the physical availability of nodes to other nodes or availability over communications channels (e.g., phone, Internet). Hence, no opportunity for triangulation with other sociometrics was available to check for data reliability.

#### 8.4.2.6 Wide Area Networks

Full contextual understanding of information and knowledge flows must encompass wide area as well as local area network connections. In data gathering, nodes were not forthcoming on the identities of advisors located outside the local area network, for reasons of commercial confidentiality. Consequently, investigations of the wide area network were limited, describing a limitation of the SNA performed. Figure 8.8 shows a *Netdraw* view of the Wide Area Network for the portal group consisting of Adopters, Business Advisors and Internet Service Providers. Tie strength, strength as measured by the number of interactions, is coded by line thickness.



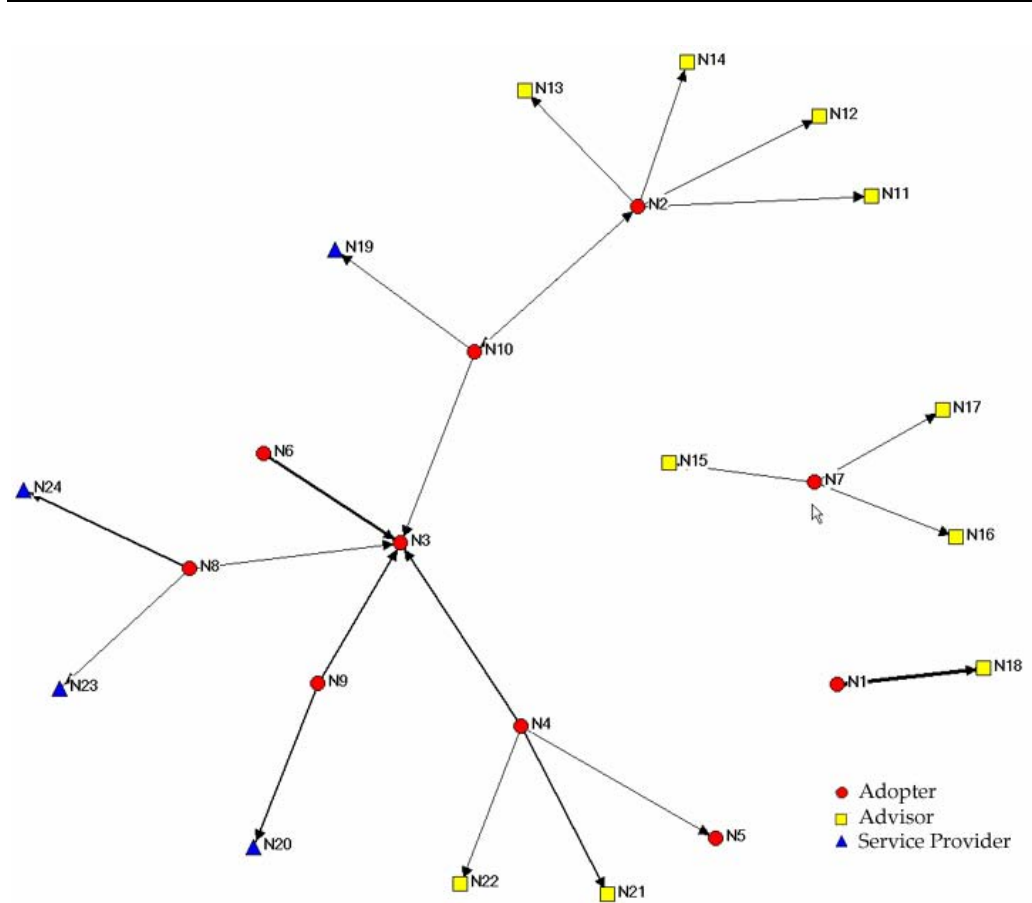


Figure 8.8 Wide Area Connections in the Portal Group

The WAN *Netdraw* view reveals that N2 displays greatest *heterogeny* as measured by ties to different nodes outside the local area network. N3 does not have *any* direct wide area connections. Local area connections display *greater* tie strength than wide area connections in the under performing E-commerce value creation faction inclusive of N4, N6 and N9, describing a propensity in these nodes for *homophilous* dyadic behaviour and local sourcing of E-commerce information and knowledge. Conversely, nodes displaying superior E-commerce value creation outcomes such as N2 and N10 display weak ties.

## 8.4.2.7 Other observations: Centrality and ego

As Figure 8.5 shows, the basic topology of the local area network is that of a star network organized around N3. Using Freeman's statistic for measuring centrality, we can attribute to the network an *Indegree* of 51.852% and *Outdegree* of 14.851% describing extreme relative centrality. Degrees attributable to each node are shown in Table 8.13:

Table 8.13 Freeman's Degree Centrality Measures-Portal Group				
	OutDegree	InDegree	NrmOutDeg	NrmInDeg
N1	0.000	0.000	0.000	0.000
N2	1.000	1.000	11.111	11.111
N3	0.000	5.000	0.000	55.556
N4	2.000	1.000	22.222	11.111
N5	0.000	1.000	0.000	11.111
N6	1.000	0.000	22.222	0.000
N7	0.000	0.000	0.000	0.000
N8	1.000	0.000	11.111	0.000
N9	1.000	0.000	11.111	0.000
N10	2.000	1.000	22.222	11.111

*Ucinet* calculates the dyad-based reciprocity in the Portal Group at 14.29%, i.e., the overwhelming majority of dyads are unidirectional describing a very *hierarchical, unbalanced* network. N3 is a point of local centrality (Scott, 2005, p.83) with an *InDegree* of 55.556, far superior to any other node in the network. The degree of a node (Hanneman, 2001, p.63) describes relative advantage in the network in terms of the number of connections. N3 enjoys clear advantage in these terms. Table 8.14 shows normalized centrality measures for all nodes inclusive of both *Degree*, *Betweenness* and *Eigenvectors* calculated by *Ucinet*:

Table 8.14 Degree, Betweenness and Eigenvector Centrality			
	Degree	Betweenness	Eigenvector
N1	0.000	0.000	0.000
N2	11.111	0.000	21.419
N3	55.556	52.778	95.302
N4	22.222	16.667	50.000
N5	11.111	0.000	21.419
N6	11.111	0.000	40.825
N7	0.000	0.000	0.000
N8	11.111	0.000	40.825
N9	11.111	0.000	40.825
N10	22.222	16.667	50.000

Higher scores correspond to greater centrality to the main pattern of distances among nodes, lower values reveal nodes that are more peripheral. The finding is important because as Brass (2003) and Hanneman (2001) agree, centrality in the network confers power and opportunity. Freeman's centralization statistic (Hanneman, 2001, p.65) "expresses the degree of inequality or variance in a network as a percentage of that of a perfect star network of the same size" and, thus, provides a guide to the distribution of positional advantage in a network. In the case of the portal group, the Freeman's Network Centralization (OutDegree) was 14.815% and the Network Centralization (InDegree) was 51.852%, describing extreme *inequality* in the distribution of positional advantage.

#### 8.4.2.8 Analysis of compound relations

In an innovation network, weightings attached to social network influence (Valente, 2005, p.104) can be categorized as *relational*, *positional* and *central*. Directed ties provide a *relational* measure of social network influence. As the columnwise analysis of ties (*k*), (*t*), (*v*) and (*a*) has shown, nodes in the portal network enjoyed different social network influence as measured by tie *strength*. However, analysis has proceeded on the basis of *single* ties. For any

given tie, the columnwise sum describes aggregate directed tie values. Thus, for tie  $(k)$  consisting of  $i$  rows and  $j$  columns and where column  $j$  represents a node ( $N1, N2$  etc) :

Choose node  $j$  for tie  $(k)$ :

$$k_j = \sum_{i=1}^n K_{ij} \quad \forall j \in 1, n$$

Analysis of compound relations (Breiger, 2004) provides a means of viewing relational data holistically, involving multiple ties. For any node  $j$  ( $j \in (1, \dots, n)$ ) where  $n$  is the number of nodes in the network, the Knowledge Capital (KC) as measured by directed tie (dt) strength exists as a collection of columnwise aggregates:

Choose node  $j$  for the tie set  $(k), (t), (v)$  and  $(a)$ :

$$KC_{dt} = \begin{pmatrix} k_j = \sum_{i=1}^n K_{ij} \\ t_j = \sum_{i=1}^n T_{ij} \\ v_j = \sum_{i=1}^n V_{ij} \\ a_j = \sum_{i=1}^n A_{ij} \end{pmatrix} \quad \forall j \in 1, n$$

Inspection of  $KC_{dt}$  for each node enables nominal comparison of the knowledge capital brought by nodes to the network. For the portal quasi-experiment, the following  $KC_{dt}$  set describes the *inspection view*:

$$\left( \begin{array}{c} k_1=8 \\ t_1=6 \\ v_1=26 \\ a_1=30 \end{array} \right), \left( \begin{array}{c} k_2=9 \\ t_2=3 \\ v_2=22 \\ a_2=36 \end{array} \right) \dots \left( \begin{array}{c} k_{10}=8 \\ t_{10}=6 \\ v_{10}=24 \\ a_{10}=28 \end{array} \right)$$

The inspection view can be sorted by Tie values to provide useful intelligence in the selection of *champions* and *opinion leaders*. For example, a sort of the KC set using Tie ( $t$ ) as the primary key suggests that the credentials of  $N2$  as a champion and opinion leader are inferior to most other nodes and that  $N3$  presents as a better candidate. Table 8.15 describes the inspection view of the KC set, sorted by Tie ( $t$ ), Tie ( $k$ ) and Tie ( $v$ ) values:

Table 8.15 Inspection view (Descending by $t$ , $k$ and $v$ )				
$n$	$k$	$t$	$v$	$a$
$N3$	9	6	29	32
$N1$	8	6	26	30
$N10$	8	6	24	28
$N8$	6	5	21	27
$N9$	7	4	19	31
$N6$	3	4	19	32
$N2$	9	3	22	36
$N4$	5	3	16	15
$N5$	3	3	15	23
$N7$	1	0	6	20

Re-sorting of the inspection set by Tie ( $k$ ), ( $v$ ) and ( $a$ ) results in other views that are useful in network engineering. For example, sorting by Tie ( $k$ ) provides evidence of where training and support resources are most appropriately invested.

#### 8.4.3 Network Analysis Summary

Social network analysis of the adopter group revealed an *informal* (Cross, Borgatti and Parker, 2003) *hierarchical* and *unbalanced* local area network for E-commerce knowledge diffusion.<sup>197</sup> Most ties are asymmetric and the network contains clear *isolates*.<sup>198</sup> Columnwise analysis of the Tie (*t*) matrix data showed that many nodes in the network do not trust other nodes. Dyad based reciprocity was measured at 0.3793, meaning that only 37.93% of all nodes, or slightly better than one third of nodes trust each other.<sup>199</sup>

Network topology also displays a clear faction with *N3* at the centre. Thus, *N3* is uniquely placed in the topology to exercise influence as an opinion maker (Rogers, 2003). As Figure 8.8 shows, *N3* also displays *Betweenness* (Hanneman, 2001, p.62) enabling *N3* to act as a bridge between this faction and superior performers *N2* and *N10*, providing further opportunities for exercising power and influence.

Node *N2* was selected to champion the portal in the adopter community on the basis of *innovativeness*. However, columnwise analysis of directed Tie (*t*) data suggests that *N2* was insufficiently trusted in the network to fulfill this role. *N3*, *N1* and *N10* were more widely trusted and present as better candidates in terms of this criterion.<sup>200</sup> The observation that the most innovative node in the network did not possess the confidence of the network as measured by directed trust ties, prompted investigation of how Knowledge Capital (*KC*) could be measured and inspected to provide a foundation for the selection of opinion leaders and to support other tasks in network engineering.

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<sup>197</sup> Section 8.4.2.2, p.334.

<sup>198</sup> Section 8.4.2.2, p.335.

<sup>199</sup> Section 8.4.2.3, p.341.

<sup>200</sup> Vide Table 8.12, p.345.

Brieger's (2004) concept of compound relations, based on calculations involving multiple tie types, suggested that the *KC* of a node might be captured as a *quadruple*. In a further iteration of these ideas, the notion of a *KC quadruple set* emerged, providing the basis of an *inspection method* for comparing *KC* accruing to nodes in the network. Inspection views could be generated from the quadruple set by *primary* and *secondary* keys to provide network engineering intelligence important in change management decision making for the selection of opinion leaders and change agents, the investment of training resources and other purposes.

## 9 Conclusions

### 9.1 Overview

Over a four year period commencing in 2001, this study has extensively investigated the phenomenon of Cyber transformation and its significance in E-commerce. This chapter:

- describes the contribution to knowledge made by the investigation;
- places key findings in the context of other work on E-commerce adoption by SMTEs and SMEs;
- describes limitations of the study; and
- proposes directions for future research.

### 9.2 Contribution to knowledge

In summary, subject to its limitations, the research has contributed to knowledge by:

- comprehensively operationalizing Cyber transformation theory and the *Marketspace Model* inclusive of factors in the technology, business and Usability domains. As a consequence, the largely descriptive work performed by Dutta and Segev in 2001 has been extended;
- demonstrating that in an industry/sector with good *product fit* to the Web channel, Cyber transformation and the *Marketspace Model* are significantly positively associated with two important B2C E-commerce metrics- *B2C revenues* and *online sales leads*. The study is the first of its kind to establish the essential usefulness of Cyber transformation theory and the *Marketspace*



*Model* as predictors of E-commerce value creation outcomes.<sup>201</sup>

Thus, within an industry/sector context, the study addresses what Zhu and Kraemer (2002, p.276) describe as a deficiency in the research literature, i.e., “the absence of empirical data to gauge the scale and characteristics of Internet initiatives and their impact on firm performance”;

- establishing that *highly* significant positive association exists between the Strategic Business (SB) dimension of the *Marketspace Model* and E-commerce value creation outcomes. From the results of testing, and within the constraints of the research, it is clear that transformation in the SB dimension is more closely associated with E-commerce value creation than Technological Capability (TC) transformation in this industry/sector;<sup>202</sup>
- establishing within a case study collaborative SMTE E-commerce innovation context, the role of network and innovation theory in understanding Co-operative or so called C-commerce adoption outcomes. In this respect, the work further evolves understanding of Critical Success Factors (CSFs) at work in Cyber transformation innovation in an SME setting and addresses Braun’s (2003, p.5) call for analysis methods that help “untangle the effects of embedded network structure on the diffusion process.”<sup>203</sup> The work performed in this area is quantitative based on *sociometric* data analysis and involves new

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<sup>201</sup> Vide Section 7.3.3, p.254.

<sup>202</sup> Vide Section 7.3.7, p.269.

<sup>203</sup> Vide Section 8.4, p. 329.

directions in SMTE C-commerce research. These new directions combine aspects of knowledge network theory (Keeble and Wilkinson, 2000; Apostolou, Mentzas and Maas, 2005, Borgatti and Cross, 2003); diffusion of innovation theory (Granovetter, 1973; Freeman, 1991; Rogers, 1995); and, social network analysis theory (Krackhardt, 2000; Breiger, 2004; Hannemann, 2001) in a proposed *Network Analysis Framework for C-commerce*. Application of the framework to the portal quasi-experimental group, enabled derivation of a sequence of network *heuristics* for the direction of change managers involved in C-commerce clustering.

This contribution is explored in the discussion that follows, beginning with a synopsis of findings and conclusions drawn in connection with the research questions that motivated the study.

### *9.3 RQ1-To what extent do Australian SMEs in an industry with good product fit to the Web channel demonstrate Cyber transformation?*

To provide a data set for investigation in a survey setting of the postulated relationship between Cyber transformation outcomes and E-commerce value creation outcomes, an industry/sector was selected and a stratified random sample of firms was constructed. The study aimed to measure Cyber transformation and E-commerce value creation in a sector of the tourism industry, an industry with good *product fit*<sup>204</sup> to the Web channel. Good product fit describes business opportunities for firms seeking to exploit the

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<sup>204</sup> Vide Section 5.2, p.144 for a summary of industry analysis that supports the claim of *product fit*. Data analysis (vide Section, 7.3.12, p.292) revealed a more complex picture characterized by significant differences in E-value creation outcomes between sectors, an outcome supported by interview data.

potential of the Web to grow revenues. Purposeful selection of an industry/sector in this way exerted control over an independent variable that might otherwise have diluted any association in the data between Cyber transformation and E-commerce value creation outcomes. Having exerted control over one independent variable, namely *product fit*, what can be said of Cyber transformation achieved in the sample? The first hypothesis to be tested was that Cyber transformation in the sample would be found to be low ( $H_1$ ).

$H_1$  was confirmed in testing. The null hypothesis was rejected on the basis of descriptive statistics that described a moderately positively skewed distribution (0.458) with strong clustering of firms around a mean (16.697) located well beneath the mid point of the 53 point scale.<sup>205</sup> In response to *RQ1*, it was therefore found that the majority of firms were manifesting lower-level cyber transformation outcomes.

The data analysis also showed that most firms are performing poorly in terms of key technologies that confer competitive and resource advantage (Porter, 1985; Lucas 2002; Affuah and Tucci, 2001). Integration of back-end office systems via Web DBMS (Amor, 2002; De Waal, 2004), for example, is found in only 9.524% of sites inspected. The use of simulation technologies and downloadable video were also uncommon.<sup>206</sup> Performance improves in the SB dimension, but in this dimension firms seem unappreciative of the importance of trust (Shukla and Pather, 2004; Affuah and Tucci, 2001, McKnight *et al.* 2002; Suh 2003; Ba *et al.* 2002; Gefen 2003; Pavlou 2003, Vuori *et al.* 2004) in doing

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<sup>205</sup> Vide Section 7.3.1, p.249.

<sup>206</sup> Vide Section 7.2.1.4, p.226.

business online, an important determinant of consumer behaviour.<sup>207</sup> Approximately thirty eight percent (37.931%) of firms support online fulfilment on their Web sites, but gather credit transaction data outside a secure server (HTTPS) environment.<sup>208</sup> The publication of privacy policy describing third party use of data gathered by the content host existed in only 12.037% of sites inspected.<sup>209</sup> Environment impact management plans, ecological footprints and other statements that enable consumers to be assured of the trustworthiness of providers, could be found in only 18.519% of the sample.<sup>210</sup>

In summary, empirical analysis of the Cyber transformation survey suggests that Australia's online effort in Ecotourism is characterized by low level Cyber transformation outcomes, a result consistent with the broader literature on Australian SME E-commerce adoption (Bode & Walker 2003; Bode, 2004; Brown 2002, , Pease & Rowe 2003).

#### *9.3.1 Conclusions: Cyber transformation in the sample (H<sub>1</sub>&H<sub>2</sub>)*

The current study also delivers a finding on the quality of Australia's SMTE online effort consistent with international trends in SMTE E-commerce adoption (Molinaroli and Buhalis, 2003; Corigliano and Baggio, 2003; Micela, Roberti and Jacuzzi, 2002). In a study of Italian SMTEs, Corigliano and Baggio (2003) employed user evaluation, rather than site inspection, as the basis of evaluation method. The models used, however, are analagous involving items in customer relations, E-commerce functionalities,

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<sup>207</sup> Vide Section 7.2.2.5, p.234.

<sup>208</sup> *Ibid.*, p.235.

<sup>209</sup> *Ibid.*

<sup>210</sup> *Ibid.*, p.236.

informational content and interactive services. Citing work by Gaudin (2002), these authors argue that the risk that accrues to inferior online outcomes extends beyond individual operators and can affect the development of whole destinations (*ibid*, p.87). A similar point is made by Braun (2002, p.47) who complains of inertia among Australian SMTEs in the embracing of network solutions as a source of “possible loss of competitive advantage for regions and the Australian economy as a whole.” Australian thinking about remedies (Braun, 2003) such as industry policy and programs aimed at aggregation and collaboration parallels European thinking about how market failure in the provision of C-commerce can be addressed.

Inspection of the data on Cyber transformation also shows above normal central tendency, with 72% of firms performing within one standard deviation of the mean ( $\bar{x} - s, \bar{x} + s$ ). Taken together, the trends of low Cyber transformation and above normal central tendency suggest that one or more of the following is at work in the sample:

- complacency and/or abandonment of the struggle for sustainable competitive advantage (Sharma and Carson, 2004);
- externalities in the operation of markets for E-commerce solutions (informational and other) (Sharma and Carson, 2004; Bode, 2002);
- inability of firms in the sample to create resource advantage in the form of a strategic online resource that is inimitable and not easily duplicated by competitors (Lucas, 2002; Straub and Klein, 2001; Affuah and Tucci, 2001);
- deficiencies in knowledge diffusion of best practice, education and training in E-commerce (Cragg and King, 1993; Darch and

Lucas, 2002; Duan, Mullins, Hamblin, and Stanek, 2002; Micela, Roberti and Jacuzzi, 2002); and

- inadequate access to resources and expertise (Mehrtens, Cragg, and Mills, 2001; Walker, Bode, Burn, and Webster, 2003).

Further data analysis and hypothesis testing enabled reflection on these and other CSF's in E-commerce adoption.

The study asked if the problem could be seen as one of firm size, resources and budgets? Hypothesis ( $H_2$ ) was devised to test for association between Cyber transformation outcomes and the factors of firm size and turnover. Using a 1-tailed Spearman's Rho non-parametric test, significant, but *weak* association with Cyber transformation was demonstrated at the critical value with both Firm Size and Turnover.<sup>211</sup> A *moderate, highly* significant association existed with Establishment budgets.<sup>212</sup> It was subsequently found that firms with establishment budgets in the range \$5K-\$15K were more likely to achieve at-or-above median Cyber transformation outcomes than firms spending less; and, no firm spending above \$15K achieved a below median outcome.<sup>213</sup>

The proposition that firms with bigger budgets should secure better Cyber transformation outcomes seems intuitively obvious. But this should not be assumed in regional markets for E-commerce solutions, where the competitive character of markets is unknown. While the strength of association as measured by *rho* describes moderate rather than strong association, and strong association would be expected if markets for E-commerce business solutions

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<sup>211</sup> Vide Section 7.3.2, p.251.

<sup>212</sup> *Ibid*, p.253.

<sup>213</sup> *Ibid*.

operated optimally, the data on budgets and Cyber transformation outcomes are sufficient to suggest that there is no supply side problem with securing value for money with Cyber transformation outcomes. However, whether firms are spending *enough* to secure E-commerce capabilities that confer competitive advantage is a different question.

Measured against this criterion, the data describe a picture of modest investment in E-commerce, with 48% of respondents spending <\$5K, with another 43% estimating investment in the range of \$5K to \$15K. Only 9% of responding firms have invested more than \$25K on E-commerce and none have spent more than \$50K.<sup>214</sup> The picture is consistent with the profile of the sample in terms of firm size, with an over-representation of micro-businesses, many of which are family businesses. Under-spending in E-commerce adoption was expected. The consequences of inferior Cyber transformation outcomes in terms of E-commerce value creation outcomes remain to be elaborated.<sup>215</sup>

Given the significant associations shown to exist between Cyber transformation and the factors of firm size, turnover and Establishment budgets, the data might be thought of as pessimistic in depiction of the possibilities for small, or micro, businesses in the emerging global information economy. Do budgets fundamentally determine E-value creation outcomes? Hypothesis  $H_5$  explored association between Establishment budgets and E-commerce value creation outcomes. Suggesting the role played by other control and independent variables, testing revealed *no* significant positive

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<sup>214</sup> Vide Section 7.1.6, p. 218.

<sup>215</sup> Vide Section 9.4 p.374.

association between Establishment budgets and B2C revenues.<sup>216</sup> However, *weak* positive association was demonstrated between Establishment budgets and sales leads.<sup>217</sup> Thus, while the data were consistent on positive association between resources and Cyber transformation outcomes, the underlying trend in the data was less clear on how comparative advantage in terms of budgets translates into E-commerce value creation. This finding provides a message of hope to smaller firms operating with smaller Establishment budgets and suggests the role of *strategy* and other factors as important determinants of E-commerce value creation outcomes.

### 9.3.2 Conclusions: Strategy and the quest for resource advantage ( $H_{20}$ & $H_{21}$ )

The observed failure of Establishment budgets to translate straightforwardly into E-commerce value creation outcomes suggested the role of other independent control variables. Golden *et al.* (2003) found E-business strategy was related to two out of three E-commerce value creation measures (sales leads generated and hits per week). The importance of strategy in E-commerce value creation is an important theme in the literature (Evans and Wurster, 1999; Harmon, Rosen and Guttman, 2001; Straub and Klein, 2001; Dutta and Segev, 2001; De Waal, 2004; Bode, 2002). However, much of this literature is not grounded in empirical analysis demonstrating association with E-commerce value creation outcomes.

The current study attempted to address this omission in a limited way with  $H_{20}$ . The study found that significant and *highly* significant differences exist in E-value creation outcomes between firms in the sample adopting E-strategy

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<sup>216</sup> Vide Section 7.3.5, p.261.

<sup>217</sup> *Ibid.*



and firms not adopting such strategy.<sup>218</sup> These differences encompassed the three core measures of E-value creation consisting of B2C revenues, online sales leads and new customers and were sufficient to reject the null hypothesis. The finding lends support to the E-strategy (Golden, Hughes and Gallagher 2003; Evans and Wurster, 1999; Small, 2000; Straub and Klein, 2001; Dutta and Segev, 2001) school of thinking on E-commerce adoption, which emphasizes the role of strategy in unlocking the E-commerce potential of the Web. However, the extent of E-strategy adoption in responding firms in the sample was disappointing, comprising some 35% of firms,<sup>219</sup> a finding in accord with outcomes from Korchak and Rodman's (2001) SME study.

The failure of SMEs to plan, document and implement E-strategy is a theme taken up by Bode (2002). In her recent Australia-wide cross-case analysis of SME website design consultant engagement and strategy for E-business development, Bode (2002, p.294) found that only 20% of the SMEs planned the development of their website, and that 78% of them outsourced the planning of strategy to a website design consultant. Bode further found that of the SMEs that outsourced strategy planning, 93% were either dissatisfied or extremely dissatisfied with the strategic skills of their consultant (*ibid*).

This study shows that initial failure to account for E-strategy as part of business planning, is perpetuated through the implementation and post implementation phases of the Systems Development Cycle (SDC), with only 35% of surveyed firms possessing a written E-strategy. Fieldwork conducted as part of the portal quasi-experiment further illuminates the underlying issues in strategy adoption and provided qualitative support for the importance of strategy found in empirical testing of  $H_{20}$ . In interview, top

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<sup>218</sup> Vide Section 7.3.9, p.286.

<sup>219</sup> Vide Section 7.1.8, p.220.

performers in terms of E-value creation revealed a hands-on attitude toward E-strategy formulation<sup>220</sup> and high levels of E-intelligence in terms of important capabilities such as Web analytics and SEO.<sup>221</sup> Firms in the portal group observed to be under-performing in terms of E-commerce value creation, admitted to learning and other barriers to the acceptance of responsibility for E-strategy, resulting in outsourcing of responsibility (Bode, 2002) or abandonment of the area altogether as part of business planning.<sup>222</sup>

The current study does not enable in depth reflection on failures in the consultant engagement process, a primary focus of the Bode (2002) study. However, data gathered on Establishment budgets suggest that half of responding firms are spending at a level insufficient to secure anything but the most basic of services from Web consultants, services that are unlikely to include E-strategy development. Thus, the current study supports findings from previous research on access to capital and its implications for online effort (Fife and Pereira, 2002; McGrath and Moore, 2002; Walker, Bode, Burn, and Webster, 2003).

Interviews conducted as part of fieldwork for the portal project also showed that firms with poor E-strategy outcomes were struggling with E-commerce fundamentals and the development of skills and capabilities making for success in the online world.<sup>223</sup> In the empirical study, one dimension of expert knowledge was investigated- the capability of deploying E-metrics as part of E-business strategy. E-intelligence is defined by the capabilities of:

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<sup>220</sup> Vide Section 8.3.4, p.324.

<sup>221</sup> Vide Section 8.3.3.2, p.321.

<sup>222</sup> Vide Section 8.3.3.1, p.318.

<sup>223</sup> Vide Section 8.3.3, p.317.

- constructing data warehouses based on the mining of E-metric data found in server logs;
- analyzing E-metric data; and
- deploying of analysis results as part of E-strategy decision making.

However, few firms in the study sample of Ecotourism operators were found to be E-intelligent and almost half (47.500%) of responding firms were found to be making no use of E-metrics.<sup>224</sup>

The problem was posed whether E-intelligence was associated with E-commerce value creation outcomes in the sample ( $H_{21}$ ). Insufficient data was obtained to allow comprehensive testing of  $H_{21}$ , however data analysis showed a *significant* difference in E-commerce creation outcomes between firms that used *E-metrics* as part of business strategy, and those that did not use E-metrics.<sup>225</sup> In the portal group, top performing firms in terms of E-value creation were also significant users of E-metrics extracted from server logs.<sup>226</sup>

Interviews conducted as part of fieldwork with the portal group suggested good prospects for firms that display E-intelligence.<sup>227</sup> As E-intelligence capabilities became established, E-strategy increased in sophistication. Observation of N2's site, for example, demonstrated an emerging understanding of how technology could be used to *link* complementary assets.

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<sup>224</sup> Vide Section 7.3.10, p.287.

<sup>225</sup> Vide Section 7.3.10, p.288.

<sup>226</sup> Vide Section 8.3.3, p.317.

<sup>227</sup> Vide Section 8.3.3.2, p.321.

With the addition of extranet capabilities, the delivery of customer relations had become possible in ways that provided for market segmentation and increasing personalization of services delivery.<sup>228</sup>

This example shows how E-intelligence shapes E-strategy for the deployment of technology assets found in E-commerce systems and resources to generate value and resource advantage. In an RBV (Wernerfelt, 1984, Barney, 1991, Zhu and Kraemer, 2002, Lucas, 2002; Zhu, 2004) view of E-commerce technologies, the evidence from this study suggests that E-intelligence and E-strategy function to connect IT capabilities with marketing, customer relations and other business assets and capabilities to deliver value. As such, both play a central role in exploiting information asymmetry (Straub and Klein, 2001) as a source of competitive advantage. As shown by the current study, Figure 9.1 depicts relationships between strategy quadrants and transformation layers that comprise the *Marketspace Model*.

Interviews conducted as part of fieldwork with the portal adopter group showed that under-performing SMTes in terms of E-value creation were struggling with E-metrics and how such metrics could be applied to refine or develop E-strategy.<sup>229</sup> Learning and access to resources presented as significant barriers to the development of E-strategy.<sup>230</sup>

#### 9.3.4 Conclusion: Connectivity transformation

Figure 9.1 shows how decisions in the strategy domain about alliances, partnering, resources, the online *Marketspace* and E-strategy are translated into discrete activity attached to layers of the transformation layers model. As a

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<sup>228</sup> *Ibid.*

<sup>229</sup> Vide Section 8.3.3.1, pp..318-320.

<sup>230</sup> Vide Section 8.3.4, p.324.

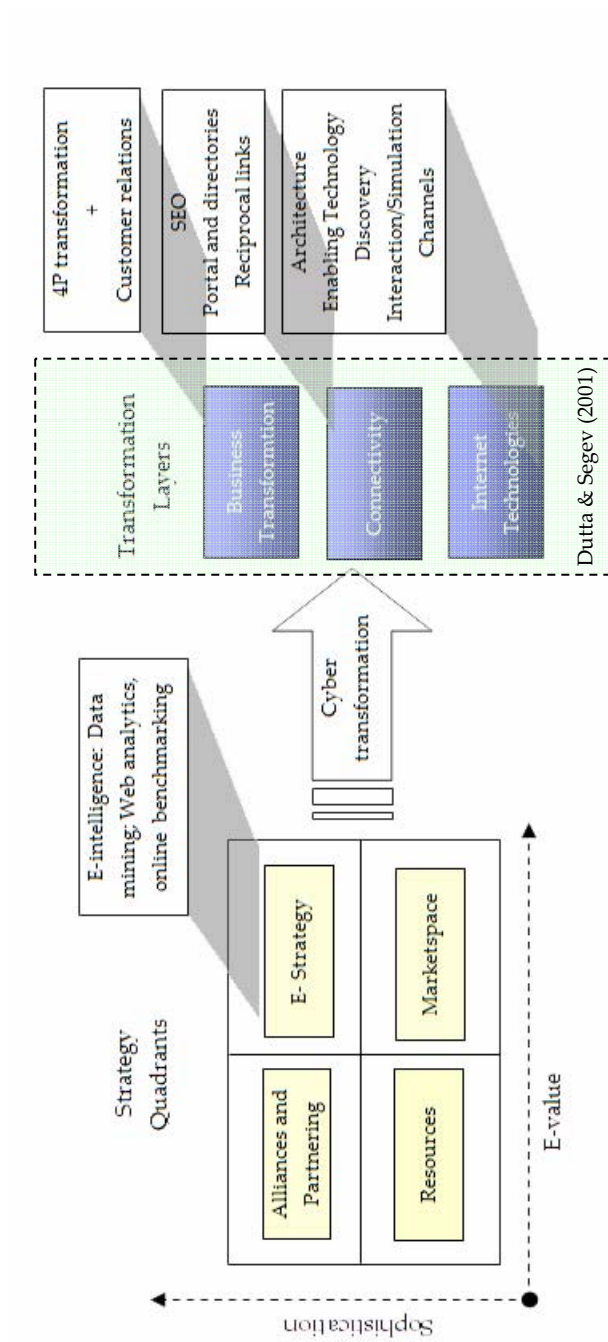


Figure 9.1 Strategy and Cyber transformation (Layers Model) (Brogan, 2005)

contribution to the research literature on Cyber transformation, the model evolves Dutta and Segev's (2001) ideas to encompass strategy quadrants and translates dimensions of the Marketspace into discrete layers with associated transformation activities. In the model, the Connectivity transformation layer functions to connect businesses with customers over the Web. Research by other researchers has shown that search costs for consumers on the Web can be high and has also questioned the assumption of greater information efficiency in online markets compared with conventional markets (Oooni and Klein, 2003; Klein, 2002). Such research emphasizes the importance of E-strategy for connecting to the Internet and the maximization of discovery opportunities through Search Engine Optimization (SEO) (Dittenbach *et al.* 2004; Bowen, 2004). To what extent did empirical analysis of survey data and fieldwork enable reflection on issues for SMTEs in exploiting nodal opportunities to connect with customers?

The contribution of discovery to E-commerce value creation was tested with hypothesis set *H<sub>8</sub>*. While discovery as a whole was not significantly positively associated with E-commerce value creation outcomes, portal links showed *marginally* significant positive association with E-commerce value creation outcomes encompassing B2C revenues and new customers acquired online.<sup>174</sup> Inspection of frequency histograms for responding firms in the sample showed a superior group of firms extensively represented on tourism industry portals. However, further investigation of the descriptive statistics showed that inferior portal count outcomes were typical.<sup>175</sup>

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<sup>174</sup> Vide Section 7.3.6.3, p.265.

<sup>175</sup> *Ibid.*

Fieldwork conducted as part of the portal quasi-experiment provided insights into the operation of E-strategy for connectivity transformation. Interview transcript data showed that top performers in terms of E-commerce value creation such as *N1* and *N2* utilized SEO to improve search engine rankings and to maximize discovery opportunities.<sup>176</sup> *N2*'s investigation of key word searching behaviour suggested tactical approaches to SEO that had improved search engine ranking and marketing effectiveness.<sup>177</sup> Firms in the quasi-experiment group with established or developing expertise in E-strategy and E-intelligence were more satisfied with their performance on-line, than firms that were struggling with strategy.<sup>178</sup> On the other hand, the owners of under-performing firms in terms of E-commerce value creation such as *N5* and *N7* admitted to incompetency in the area of E-strategy for connectivity transformation. In the local network of portal adopters, opinion about the value of E-strategy for connectivity transformation was divided with *N3*, a local Web designer and advisor to *N5* and *N7*, rating the quest to improve search rankings a potential waste of time and money and secondary in importance to multimedia.<sup>179</sup>

Once again, fieldwork revealed contrasting norms and beliefs on the nature and importance of an element of E-strategy and focussed attention on learning outcomes in training in E-commerce adoption practices and principles.

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<sup>176</sup> Vide Section 8.3.4, p.324.

<sup>177</sup> Vide Section 8.3.3.2, p.321.

<sup>178</sup> Vide Section 8.3.4, p.324.

<sup>179</sup> Vide Section 8.3.3.2, p.321.

### 9.3.5 Conclusion: C-commerce and SMTE innovation

#### 9.3.5.1 C-commerce activity in the survey sample

Figure 9.1 depicts alliances and partnering as a quadrant within the strategy domain, a view grounded in the literature discussed in *Chapter Two*. This literature emphasized the importance of clustering, networking and community building for E-commerce innovation (Braun, 2003; McGrath and More, 2002; Rowe, 2004; Nodder *et al.* 2003). From the securing of a resource advantage (Lucas, 2002) to market access, synergistic and value creation partnership benefits (Rowe, 2004), co-operative activity offers opportunities to leverage online activity more effectively and to address competitive disadvantages arising from small E-commerce budgets and problems with access to expertise and resources. Other researchers argue that networks are essential for competitiveness in an era of economic globalization. For Castells (2000, p.102), networks form critical infrastructure for the “regionalized global economy” that positions regions in the era of economic globalization. Porter (1998) lends support to this view describing competitive advantage as something that emerges from ‘localized processes’ and which can only be sustained in the global economy by ‘local knowledge, relationships and motivation that cannot be readily duplicated by global partnering’.

Evidence of co-operative activity in sample data was weaker than expected. Alliance advertising, based on reciprocal advertising agreements with online partners, was found in less than half of the firms that responded.<sup>180</sup> This kind of collaborative activity can operate at the level of an informal partnership or more formally as a strategic alliance. When asked to rate the impact of E-commerce on alliances and collaborations, the data analysis showed survey

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<sup>180</sup> Vide Section 7.2.2.2, p.230.



respondents to be undecided.<sup>181</sup> Investigation also revealed that only two respondents to the *E-commerce Adoption Survey* had joined forces to create a purpose designed Ecotourism portal<sup>182</sup> providing a one stop gateway to regional product and services. Studies by Klein (2002) and Oorni and Klein (2003) have shown positive association between one stop shopping and consumer satisfaction, suggesting the business logic for collaborative portal approaches.

In summary, descriptive and inferential statistical analysis of survey data across metrics extending from low level co-operation (reciprocal links) to E-clustering (Rowe, 2004) around regional portals showed disappointing progress in the adoption of C-commerce practices and models. The third component of the design, the portal quasi-experiment, applied a *collaborative* Cyber transformation treatment in a regional tourism setting. Data analysis provided insights into the operation of Cyber transformation principles in a field setting and CSFs in C-commerce adoption.

#### 9.3.5.2 *Cyber transformation and C-commerce: The Portal Quasi-Experiment*

Australian innovation research (Dodgson, 2000; Marceau, 1998) has framed new economy business innovation around knowledge, learning, productivity efficiencies and competitive advantage. The survey component of the research showed that in Ecotourism, businesses with superior Cyber transformation Web sites had a statistically significant likelihood of superior financial success across two measures of financial success, compared with other firms. Thus, in terms of this industry, the evidence suggests that Cyber transformation offers a competitive advantage (Lucas, 2002; Straub and Klein,

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<sup>181</sup> Vide Section 7.3.11, p.289.

<sup>182</sup> Vide Section 7.3.6.3, p.265.

2001; Affuah and Tucci, 2001). However, to be convincing, such evidence would require further confirmation, hence the research design encompassed a triangulatory component based on a 'quasi experiment' (Cook and Campbell 1979, O'Hara 1999), i.e., the *Cape Range Ningaloo Ecovortal Project*.

The portal applied a Cyber transformation treatment to a cluster of SMTEs with characteristics similar to those of the survey sample. The design provided for measurement of E-value creation outcomes before and after application of the Cyber transformation treatment to the experiment group, thus enabling confirmation or otherwise of conclusions from the survey component of the research. However, the experiment did not return an *empirical* finding on RQ2, because of failure to achieve participation appropriate to inferential statistical analysis. Whilst the portal project did not proceed according to the project plan, it nonetheless yielded a rich vein of qualitative and *sociometric* data. Conceived as a case study, the portal project yielded important insights into Cyber transformation innovation and CSFs in regional SMTE clustering.

Core functionality provided by the portal solution offered Ecotourism businesses ICT resource advantages in destination marketing.<sup>183</sup> These advantages encompassed Internet capabilities that did not previously exist and were costly to SMTEs outside the shared infrastructure solution provided by the portal. Specifically, without aggregation around a single service provider, the mobile integration capability provided by the portal would be dispersed, incurring service provision costs for individual operators and generating back-end office integration issues. Thus, the portal provided an opportunity to evolve a collaborative C-commerce solution for the region

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<sup>183</sup> Vide Section 5.5.3, p.176.

where firms could embark on a pathway of “competitive co-evolution, enhanced by digital platform features” (Ordanini, 2001, p.536).

*Chapter Eight* comprises an analysis and interpretation of results from the portal experiment, based on web logs, interviews, field observations and a knowledge network analysis of the knowledge domain of owner/operators that participated in the quasi-experiment. Conclusions from this analysis follow.

#### *Conclusions from Web log analysis*

As *Chapter Eight* relates, aggregate data such as portal bandwidth served, sessions, hits and pages viewed<sup>184</sup> describe a passive site in which content depth, quality and membership were insufficient to fuel sustained user growth. Review of the aged analysis of bandwidth served shows that the portal attracted most visitors during the period in which document upload activity was concentrated and thereafter declined steadily. With static content and no new projects, no good reasons existed for visitors to return to the portal, and this is reflected in the decline in bandwidth served over the measurement period. However, no conclusive finding regarding value created is possible in the absence of data describing referrer domains, search engine keywords and sales leads generated.

What is clear from the analysis, is that the portal did not achieve *demand side* ‘critical mass’ (Preece, 2000), a state or condition representative of an expanding market as measured by visitations and subscription related activity. The achievement of critical mass required owner/operator *commitment* to the project as measured by uploads of new content and the creation of new projects. This commitment was not forthcoming, describing

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<sup>184</sup> Vide Section 8.2.1, p.305.

another critical mass condition on the *supply side* (Rogers, 2003, p.163) characterized by individual operator adoption thresholds not being satisfied.

Thus, portal project outcomes were similar to those recorded by Braun (2003) in her study of regional clustering based on the Grampians region of Northern Victoria. Why did owner/operators not commit to the project beyond project library creation and initial upload activity? The researcher turned to fieldwork data in the form of interviews and observations to provide more in-depth understanding.

#### *Conclusions from Fieldwork*

Interview transcripts showed that adopters were happy with the design and marketing of the solution and did not experience usability issues.<sup>185</sup> Interviews also showed that a variety of *endogenous* and *exogenous* CSFs, familiar from the wider literature on E-commerce adoption, were at work in determining the adoption outcome. In-text referenced against the literature, these CSFs included:

- Education and training in Technology and Management (Cragg and King, 1993; Darch and Lucas, 2002; Duan, Mullins, Hamblin, and Stanek, 2002; Micela, Roberti and Jacuzzi, 2002);<sup>186</sup>
- Technology/Applications and Hardware/Software (Lewis and Cockrill, 2002; Walker, Bode, Burn, and Webster, 2003);<sup>187</sup>

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<sup>185</sup> Vide Section 8.3.1, p.313.

<sup>186</sup> *Ibid.*, p.313.

<sup>187</sup> *Ibid.*

- Awareness and Understanding/Access/Affordability (Mehrtens, Cragg, and Mills, 2001; Walker, Bode, Burn, and Webster, 2003);<sup>188</sup>
- Business Analysis and Planning readiness including strategy formation (Chau, 2003; Scupola, 2002, Buhalis, 1996; Buhalis, 2003);<sup>189</sup>
- Culture (Evans and Peacock, 1999; Hull and Milne 2001; Wilson, 2002; Nodder *et al.* 2003; Braun, 2003).<sup>190</sup>

Reflections on the portal C-commerce platform and its relationship with existing business models were provided by operators *N10* and *N2*. For *N10*, the *resource advantage* provided by mobile integration was not persuasive. Risk pertained to the project because of its potential to “draw traffic away from my web site, which is where I want to do my E-business.”<sup>191</sup> For *N10*, the E-shop model would remain the focus of online effort. *N2* the project champion, identified the issue of *control* as the pivotal one for the operator community and the primary reason why, in spite of his best efforts, the solution had not been fully embraced by the community.<sup>192</sup> Whilst nominally committed to the project and its strongest advocate, observation showed that *N2*’s position was equivocal. Rather than support virtual community on the

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<sup>188</sup> Vide Section 8.3.2, p.315.

<sup>189</sup> *Ibid.*

<sup>190</sup> Vide Section 8.3.2, p.316.

<sup>191</sup> Vide Section 8.3.6, p.327.

<sup>192</sup> Vide Section 8.3.2, p.316.

portal, N2 chose to imitate this part of portal functionality on his own web site.<sup>193</sup>

N2's comments on control suggested the role of social factors such as *power* and *influence* in shaping response to the collaborative platform. Interview data describing E-commerce learning outcomes also suggested the need to investigate essentially *social phenomena*, and, in particular, how normative positions on E-commerce propositions were formed within the community. Interview transcript data showed that while the community contained some excellent E-strategists and practitioners of E-commerce, *knowledge diffusion* of good practice was ineffective, with some operators displaying learning outcomes inappropriate for good practice E-commerce adoption.<sup>194</sup> The researcher turned to *sociometric* data and the methods of social network analysis in an attempt to understand information and knowledge flows in the treatment group and their relationship with adoption outcomes. Section 9.7 describes conclusions from analysis of the *sociometric* data set. Fieldwork also provided qualitative triangulatory confirmation of findings from the empirical analysis of survey data on the relationship between cyber transformation and E-value creation. Discussion of this contribution follows in the next section.

#### 9.4 RQ2- *What relationship, if any, exists between increasing Cyber transformation and E-commerce value?*

A postulated relationship between Cyber transformation outcomes and E-commerce value creation outcomes formed a focal relationship earmarked for investigation by the study. Whereas, RQ1 focussed on the Cyber transformation construct and investigation yielded findings about Cyber

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<sup>193</sup> Vide Section 8.3.3.2, p.321.

<sup>194</sup> Vide Section 8.3.4, p.325.

transformation found in the survey data set, RQ2 was used to provide a basis for investigating Cyber transformation's contribution to E-commerce value creation. Hypothesis set  $H_3$  was devised to enable this question to be answered. The research design acknowledged two control variables, one independent (Cyber transformation) and the other antecedent (Usability), at work determining outcomes in the independent variable (E-commerce value). The first tests were bivariate in nature and directed at assessment of association between Cyber transformation and E-commerce value creation. Later, a two factor model inclusive of Cyber transformation and Usability was tested using Simultaneous Multiple Linear Regression.<sup>195</sup>

*9.4.1 Conclusion RQ2: Relationship between increasing Cyber transformation and E-commerce value creation outcomes.*

Section 7.3.3 reported the results of bivariate testing for association between Cyber transformation and E-commerce value creation outcomes in the Ecotourism sample.<sup>196</sup> Results were sufficient to exclude the null hypothesis for two of the three hypotheses forming the set  $H_{3.2}$ - $H_{3.4}$ . Cyber transformation in the sample *is* significantly positively related to E-commerce value creation outcomes, inclusive of B2C revenues ( $H_{3.2}$ ) and sales leads ( $H_{3.3}$ ). Strength of association as measured by *rho* is strongest in the case of the new economy metric of online sales leads.<sup>197</sup> The existence of a demonstrable positive relationship between Cyber transformation and E-commerce value creation in the sample, suggests that in Ecotourism, Cyber transformation theory is a *useful* tool for understanding E-commerce firm performance.

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<sup>195</sup> Vide Section 7.3.8, p.274.

<sup>196</sup> Vide Section 7.3.3, p.254.

<sup>197</sup> Vide Section 7.3.3, p.256.

Results from fieldwork in the form of owner/operator interview transcripts showed that firms with superior Cyber transformation E-commerce web sites in the portal treatment group derived superior E-commerce value creation outcomes relative to outcomes achieved by other firms.<sup>198</sup> Thus, interview data provided important triangulatory confirmation of an empirical finding from the survey component of the research design. *Chapter Eight* provides an account of the sophisticated strategies in use in these firms and their relationship to activity in transformation layers. For example, in the Internet Technology transformation layer, firms were observed to be involved in the use of simulation with Macromedia Flash (N10), forums (N2) and video (N1). Sophistication was also observed in the Connectivity transformation layer with SEO and data mining of Web logs.<sup>199</sup>

The positive finding on the usefulness of Cyber transformation theory adds to the literature on SMTE E-commerce adoption discussed in the *Literature Review*. Findings are closely aligned with the thinking of researchers that emphasize the importance of *expertise* and *strategy* formation skills in SMTE E-commerce (Buhalis, 1996; Buhalis, 2003; Hull and Milne 2001; Nodder *et al.* 2003).

#### 9.4.2 *Limitations on findings on E-commerce value creation and Cyber transformation*

Within the current research design and resources available, it has not been possible to account for the role of *all* independent and control variables, and this situation forms an acknowledged limitation of the research. This limitation points to the scope for future research on Cyber transformation

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<sup>198</sup> Vide Section 8.3.4, p.324.

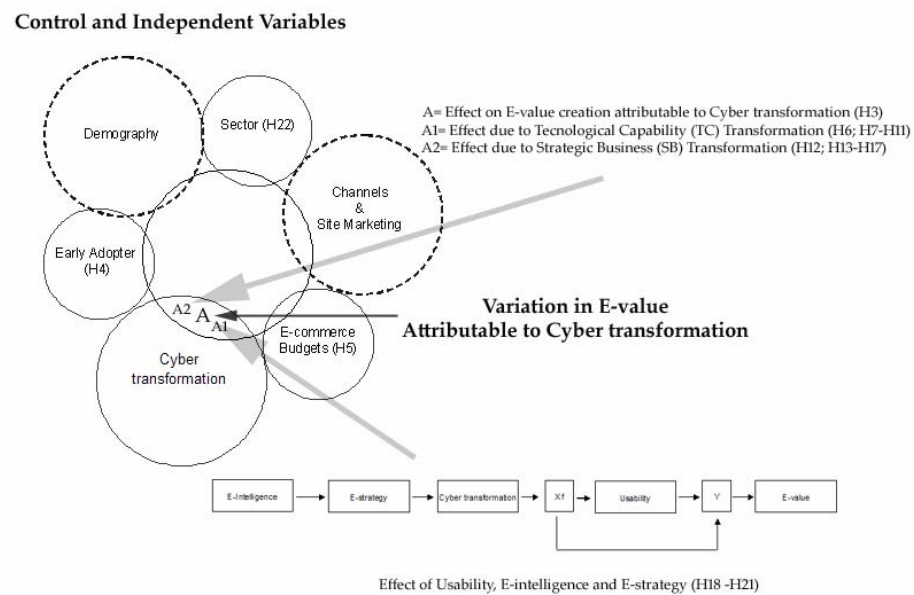
<sup>199</sup> Vide Section 8.3.3.2, p.321.



theory involving more elaborate research designs. Specifically, the contribution to co-variation made by the following independent control variables has not been measured and factored into the analysis:

- Multi-channelling. The behaviour of consumers whereby multiple channels such as the Web, print and broadcast media contribute to purchasing behaviour and sales cannot reliably be attributed to any particular channel;
- Demographics. Where market share is substantially based on an older demographic displaying low levels of computer literacy and resistance to the Web channel, higher cyber transformation scores are unlikely to translate into higher E-commerce value creation outcomes; and
- Marketing budgets. Firms spending more on the marketing of E-commerce web sites are likely to record greater returns from online activity (De Waal, 2004).

Figure 9.2 describes the relationship of these variables to other independent variables that were the subject of hypothesis testing:



**Figure 9.2 E-value creation: Independent, control and intervening variables (Brogan, 2005)**

Only a handful of operators that participated in the study, rigorously maintained sales data that described Web sales. Most relied upon estimations. Even if a customer had been acquired over the Internet by email, whether such a capture should be attributed to online activity or was the product of multi-channel influences on consumer behaviour (word-of-mouth, value proposition, print media advertising) was open to question. While many operators in the course of interviews revealed analysis data that described the number of customers “who found us on the Internet”, only a few had developed more in-depth market analysis tools enabling the attribution of sales to particular channels.

Acknowledging these limitations, this research has produced an important triangulated finding on the relationship between Cyber transformation and E-commerce value creation outcomes. This finding is valuable to SMTEs contemplating the perennial issue of where they might most profitably commit in terms of Internet capabilities, functionality in terms of E-commerce

capabilities and the online *Marketspace*. Within a single industry/sector, it also address what Zhu and Kraemer (2002, p.276) describe as a deficiency in the research literature i.e. “the absence of empirical data to gauge the scale and characteristics of Internet initiatives and their impact on firm performance.”

In common with other empirical research aimed at the exploration of association between variables in data sets, findings are offered subject to the caveat that they describe association and are not a description of causality. Additionally, since the current study concerns only one industry/sector, no claim as to the general usefulness of the Cyber transformation theory is possible without equivalent investigations involving other industries, products and services. As Sanathanam and Hartono (2003, p.126) put it, a true test of ‘usefulness’ entails *replication, extension and generalization*.

*9.5 RQ3-Which dimensions of transformation and, which clusters within these dimensions, are important in determining E-commerce value outcomes?*

Findings on RQ2 shed no light on the contribution of dimensions and clusters within dimensions to the observed effect. RQ3 sought to investigate the respective contributions of dimensions and clusters within the model to any observed associations between Cyber transformation and E-commerce value creation outcomes in the Ecotourism survey sample.

#### *9.5.1 Conclusion: Technological Capability and Strategic Business transformation*

Sections 7.3.6.2 and 7.3.6.3 reported findings from testing of hypotheses sets  $H_{7.1-7.4}$  and  $H_{11.1-11.4}$ , which sought to explore association between Technological Capability (TC) transformation and the E-commerce value creation measures of B2C revenues, sales leads and new customers. Weak *marginal* positive

association could be seen between TC transformation and sales leads,<sup>200</sup> but no significant positive association was observed with B2C revenues or new customers acquired online. Thus, at the dimensional level of the *Marketspace Model*, the TC dimension does not appear to exhibit strong positive association with E-commerce value creation outcomes. Within the dimension, the use of video<sup>201</sup> (visualisation) and portal links (discovery)<sup>202</sup> were the only scale items that showed *marginally* significant positive association with any of the three E-commerce value creation measures adopted for the study.

The situation with the Strategic Business (SB) dimension presents a different story from that of Technological Capability (TC). From the analysis, it is clear that in terms of association with E-commerce value creation outcomes in the sample, transformation along the SB dimension is more important than the TC dimension. Specifically, testing revealed *highly* significant positive association between SB transformation and B2C revenues and sales leads: association (as measured by rho) is also *stronger* in each instance.<sup>203</sup> From the results of testing, it is clear that transformation in the SB dimension is more closely associated in the sample with E-commerce value creation outcomes than TC transformation.

Results from testing for cluster association with E-commerce value creation within the SB dimension are described in section 7.3.7. Analysis showed that a significant positive association exists between *Promotion* transformation and *all* three E-commerce value creation metrics. With B2C revenues and sales

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<sup>200</sup> Vide Section 7.3.6.1, p.262.

<sup>201</sup> Vide Section 7.3.6.3, p.265.

<sup>202</sup> *Ibid.*, p.269.

<sup>203</sup> Vide Section 7.3.7, p.271.

leads association is *highly* significant.<sup>204</sup> The value of the correlation coefficient shows *strong* association between promotion transformation and sales leads.<sup>205</sup>

Customer relations transformation was *moderately* significantly positively associated with two of the three E-commerce value creation metrics- B2C revenues and online sales leads.<sup>206</sup> Product transformation and Price transformation were not significantly associated with E-commerce value creation at the critical value, a finding that sits uncomfortably with the *Marketspace model*. However, characteristics of the data set suggest the need for further research before conclusions are drawn. Specifically, no Web sites were identified that supported product/service customization and no usable data was obtained on customer input to specification and design. Only one site in the sample failed the online directory of products and services test. Thus, Product transformation scores when measured against the scale displayed an extreme *lack* of variance.<sup>207</sup> In the Price cluster, scores similarly displayed *lack* of variance with no instances of dynamic price customization or online price negotiation found in the data set.<sup>208</sup> Figure 9.3 depicts the results from hypothesis testing in terms of the layers model. In this figure, clusters and factors within clusters displaying significant or highly significant association with E-commerce value creation at the critical value are attached to parent layers and the E-strategy quadrant is elaborated in activity terms.

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<sup>204</sup> *Ibid.*, p.273.

<sup>205</sup> *Ibid.*

<sup>206</sup> *Ibid.*

<sup>207</sup> Vide Section 7.3.7, p.273.

<sup>208</sup> *Ibid.*

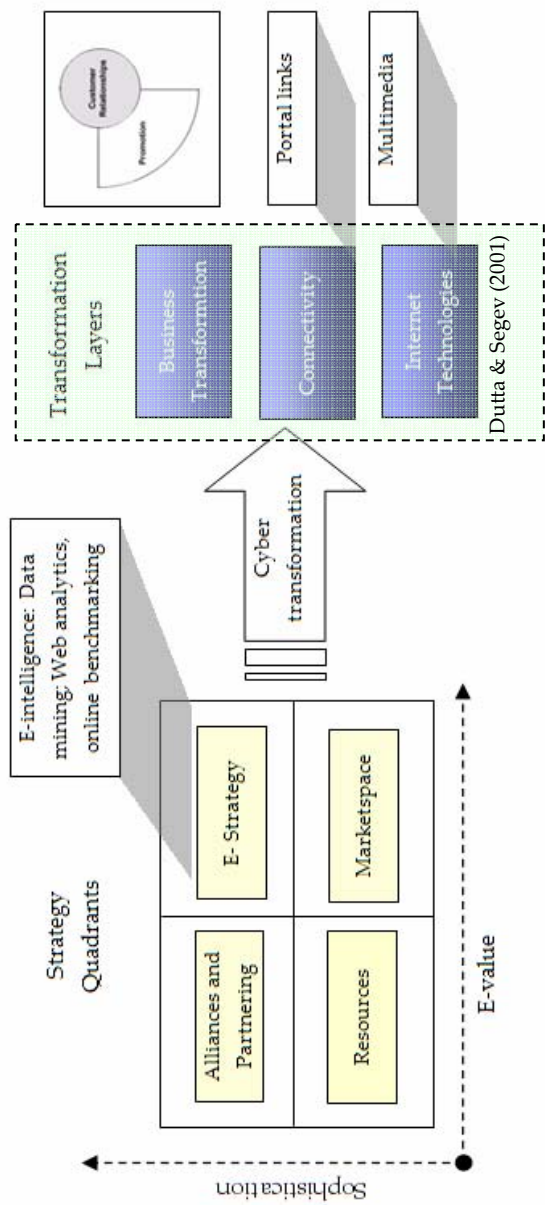


Figure 9.3 Cyber transformation layers (Ecotourism) (Brogan, 2005)

The model customizes the generic model found in Figure 9.1 to provide an Ecotourism industry specific view of significant clusters and CSFs.

In terms of this industry, the evidence suggests that Cyber transformation offers a competitive advantage (Lucas, 2002; Straub and Klein, 2001; Affuah and Tucci, 2001). Since Cyber transformation theory is strategy based and emphasizes the roles of business transformation and traditional business practice in successful transition to E-commerce, the finding is consistent with the positions of Porter (2001), Fenty (2002) and other E-sceptics who challenge the perception of the Internet as a revolutionary phenomenon in business.

As Porter (2002, p.78) says:

“In our quest to see how the Internet is different, we have failed to see how the Internet is the same. While a new means of conducting business has become available, the fundamentals of competition remain unchanged.”

As Hoffman and Novak (2001, p.3) put it, the Internet “does have unique characteristics that must be acknowledged and addressed in any business strategy going forward, but they do not change everything.” However, specific as it is to one industry and derived from a sample of only 108 firms, findings from the current study do not provide a suitable basis for generalization and none is attempted.

Cyber transformation theory sits compatibly with the RBV view of the role of information technology (Wernerfelt, 1984, Barney, 1991, Zhu and Kraemer, 2002, Lucas, 2002; Zhu, 2004) in firm performance. RBV emphasizes that payoff from IT comes from its ability to link complementary resources. Endorsement through empirical testing of a model that emphasizes the strategic application of resources and exploration of complementarity is a good result for RBV, but once again, the result does not provide a suitable basis for generalization and none is attempted.

### 9.5.2 Four Factor Model and Strategy

At the dimensional level, SB transformation based on the concept of the *Marketspace* and customer relations shows a *more significant* and *stronger* positive association with E-commerce value creation outcomes than TC transformation. In reviewing results from analysis, the respective contributions of the dimensions become clear. TC transformation is a *marginally* significant predictor of online sales leads, the least robust of the three measures.<sup>209</sup> SB transformation on the other hand, brings clear old economy benefits to Ecotourism operators in terms of B2C revenue and new customer outcomes.<sup>210</sup> How would the SB clusters of Promotion and Customer relations compare with strategy and sector in an enhanced multi-factor model? Multiple linear regression using ANOVA analysis was used to test this four factor model. Testing pointed once again to *strategy* working as the most significant predictor of outcomes in the multi-factor model.<sup>211</sup>

Results from testing of the multi-factor model supported earlier findings in bivariate testing on strategy and results from fieldwork with the portal group. Strategic objectives drive strategy formation. Strategy informs the selection and shaping of activity in the various transformation layers. For example, in the portal group, N2 adopted the strategic objective of improving search engine ranking and visibility. The corresponding transformation layer activities encompassed the SEO (Bowen, 2004) activity of keyword optimization and other SEO activity aimed at search engine 'friendliness'. N2 achieved his strategic objective and at the time of interview was number one

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<sup>209</sup> Vide Section 7.3.6.1, p.262.

<sup>210</sup> Vide Section 7.3.7, p.270.

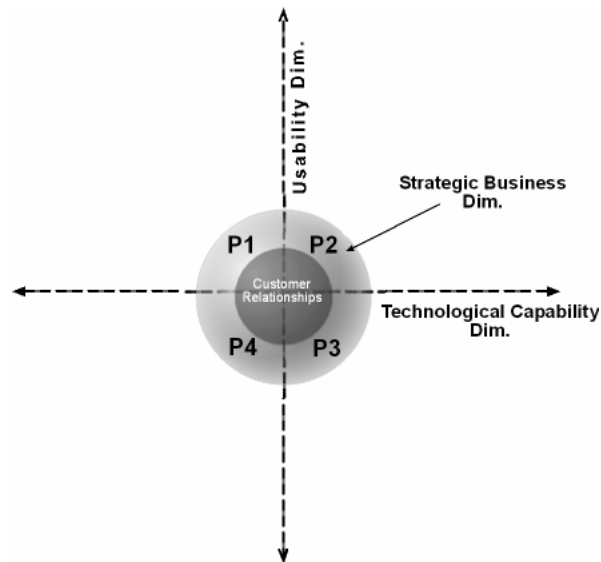
<sup>211</sup> Vide Section 7.3.12, p.296.



on Yahoo.<sup>212</sup> Figure 9.1 situates such a construction of the role of strategy and conclusions from testing of the multi-factor model in terms of a transformation layers model.

### 9.5.3 Cyber transformation: Usability a third dimension?

Two hypotheses sets were devised to test for association between Usability and E-commerce value creation outcomes, the first involving Usability and E-commerce value creation only (H<sub>18.1-18.4</sub>); and, the second based on the proposition that Usability in combination with Cyber transformation worked to determine outcomes in the sample (H<sub>19.1-19.4</sub>). It was postulated that a third dimension of Usability might exist that should be incorporated into the model. The suggestion that Usability might furnish an additional dimension to the *Marketspace model* was grounded in review of the literature (Nielsen, 2000; Palmer (2002); Agarwal and Vishwanath (2002) and Hahn and Kauffman 2004). The revised model is described in Figure 9.4:



**Figure 9.4 Usability Enhanced *Marketspace* Model (Brogan, 2005)**

<sup>212</sup> Vide Section 8.3.3.2, p.321.

However, the data analysis of Usability in the sample did *not* support a revised model that incorporated a Usability dimension. As section 7.3.8 describes, the null hypothesis could not be rejected. The result suggests Frokjaer, Hertzum and Hornbaek's (2000, p.23) conclusion on Usability, namely, that "correlations among the measures may vary widely depending on task domain and context." In a population characterized by low levels of transformation, comprising simple, shallow sites, with low levels of online fulfilment adoption, Usability was not an issue. Further research is therefore required based on other industries and sectors with greater heterogeneity in terms of Cyber transformation, depth and functionality, before any conclusion may be drawn about the enhanced *Marketspace Model* inclusive of Usability.

#### 9.6 RQ4- *How useful is Cyber transformation theory as an explanation for E-commerce adoption?*

##### 9.6.1 Conclusion: *Usefulness of Cyber transformation theory*

Findings from investigation of RQ2 and RQ3<sup>213</sup> enable reflection on the usefulness of Cyber transformation theory and the *Marketspace* model as an explanation for E-commerce adoption in Australian Ecotourism. Within the context of the current study, the Dutta and Segev (2001) model was found to be useful, but not a good predictor of E-commerce value creation outcomes when *strong* association and *high* significance are used as standards to assess the importance of the associations observed. While positive association was demonstrated between Cyber transformation and E-commerce value creation, the best outcome achieved involved only *highly* significant, moderate positive

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<sup>213</sup> Vide Sections 9.4 and 9.5, pp.

association.<sup>214</sup> This finding involved the new economy metric of sales leads, thus presenting something of a hook for Cyber transformation sceptics. The finding also begs the question of whether issues concerning domain validity, construct operationalization, and/or instrument reliability or validity or some combination, function to *dilute* the association.

In the course of the analysis, outcomes from data analysis informed the creation of a transformation *layers model* that described the transition from the strategy domain to E-commerce activity and functionality based on the layers of Business Transformation, Connectivity and Internet Technologies.<sup>215</sup>

The model encapsulates important findings from both survey and quasi-experimental components of the research concerning the roles of strategy, the *Marketspace* and E-intelligence in E-commerce value creation. The order in which layers have been determined reflects the relative strength of findings, with business transformation involving the *strongest* measured positive association with E-commerce value creation. The model connects strategy theory (Golden *et al.* 2003; Evans and Wurster, 1999; Harmon, Rosen and Guttman, 2001; Straub and Klein, 2001; Dutta and Segev, 2001; De Waal, 2004; Bode, 2002) with RBV thinking about the value of Information Technology to the firm, and the leveraging of technology to achieve new value through the exploitation of complementary resources (Wernerfelt, 1984, Barney, 1991, Zhu and Kraemer, 2002, Lucas, 2002; Zhu, 2004).

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<sup>214</sup> Vide Section 7.3.3, p.256. For the purposes of this investigation, the standard for strong association was set at values for the correlation coefficient ( $\rho$ ) of  $\geq 0.5$ . Significance at the  $\alpha$  values of 0.5 and 0.01 respectively defined significance and high significance.

<sup>215</sup> Vide Figure 9.1, p.365.

However, this claim of usefulness is grounded in analysis of E-commerce value creation outcomes and related E-commerce capacities in one industry sector and sub-sector, with a small population and sample size. Other limitations of the current study were acknowledged in previous discussion.<sup>216</sup> Thus, further research is required into the nature and significance of Cyber transformation theory and the *Marketspace Model* in multiple industry sector contexts, before any claim can be made in terms of *generalizability* and *validity*.

#### 9.6.2 Directions for future research in Cyber transformation theory

Thus, further research is required both to validate the scale and to develop models that provide valid representations of CSFs that are positively associated with E-commerce value creation outcomes in other industries and sectors. An important challenge for future research posed by this study is to develop a more sophisticated approach to modelling that takes into account *warping* of the *Marketspace* by factors that are industry/sector or product specific. The logic of *Marketspace* warping is suggested by the finding that for some tourism product, factors such as *customer input to specification and design* or *dynamic price customization* do not display good domain relevancy. It is arguable that such characteristics in a data set did not make for reliable testing of the nature and importance of *Product* and *Price* transformation. As discussed in Section 9.5.1, there was an extreme lack of variance in scores in the Product and Price transformation clusters. In other industries where such factors display good domain relevancy, such an outcome may *not* have been repeated and analysis may have resulted in a different view about the nature and importance of Product and Price transformation.

Unlocking the potential of the *Marketspace* in this way involves taxonomic analysis of markets in terms of such factors. The benefits of such analysis

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<sup>216</sup> Vide Sections 9.4.2, p.375 and 5.8, p.188.

extend beyond validation testing of instruments and models. By analyzing the way the *Marketspace* is warped by independent control variables, industry specific models or transformation profiles may be developed that provide businesses with more reliable guidance about where online strategy can be best directed by firms to secure E-competitive advantage.

Research should also involve populations displaying greater variance in terms of Cyber transformation outcomes. Descriptive statistics showed above normal central tendency in terms of Cyber transformation scores. Whilst this was not extreme, evidence of adoption of technology such as simulation, or functionality such as online fulfilment, was often found wanting and inhibited data analysis. Ideally, future research will involve larger populations and sample sizes, which will work to improve the reliability of findings.

The current research has suggested directions for future research involving clustering of SME's. In industries where small and micro business predominates, clustering around shared solutions and co-operative practices provides pathways to resource and competitive advantage. Citing Pavlovich (2003, p.547), Braun declared that firms excluding themselves from such linkages "may end up disadvantaged as such inter-firm connections often results in market visibility and strategic leverage". *Chapter Two* revealed an emerging SME research literature that addressed issues in SME clustering and networking (Nodder *et al.* 2003; Wilson, 2002; Braun, 2003; Rowe, 2004; Pavlovich, 2003).

Successful clustering presents cultural (Evans and Peacock, 1999; Nodder *et al.* 2003) and other challenges to change agents that are documented in the literature. Through the lens of the portal quasi-experiment, which provided a shared infrastructure advanced Cyber transformation capability to a cohort of regional SMTEs, the study reflected on the problem of networking and cluster building.

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### 9.7 RQ5- *What role do networks play in collaborative Cyber transformation innovation in an SMTE network?*

RQ5 sought to explore the contribution of network factors in the achievement of Cyber transformation innovation in a C-commerce setting. The quest to secure innovation in SME E-commerce has resulted in a C-commerce trajectory that emphasizes ideas of ‘competitive co-evolution’ (Ordanini, 2001), ‘collaborative culture’ (Li and Du, 2005; Braun, 2003) and ‘entrepreneurial networks’ (Molinaroli and Buhalis, 2003). Recognizing that C-commerce and clustering of SMEs requires the changing of deep rooted cultural behaviour (Evans and Peacock, 1999; Nodder *et al.* 2003; Wilson, 1996; Braun, 2003), investigation of the operation of social relations and SME network behaviour has gained acceptance in the SME E-commerce research agenda. Discussion of the research literature encompassed two SMTE domain specific case studies in which network and social factors loomed large in the discussion of innovation outcomes.<sup>217</sup> A conclusion from the review was that methods and tools are indeed required to assess the significance of networks to innovation and where possible to “untangle the effects of the embedded network structure on the diffusion process” (Braun, 2003, p.5). The portal provided an opportunity to investigate network behaviour and how it shapes the formation of *human capital* (Coleman, 2003) required for C-commerce innovation involving high level Cyber transformation.

#### 9.7.1 *Knowledge and Social Pathways to Human Capital for Clustering and innovation in SMTE E-commerce*

The portal quasi-experiment sought to apply an advanced Cyber transformation treatment representing a C-commerce *innovation* to domain actors. To generate critical mass (Rogers, 1995; Preece, 2000) and hence, to

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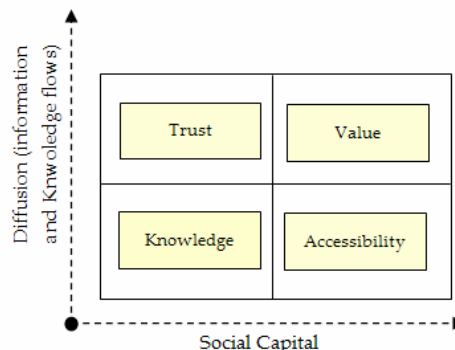
<sup>217</sup> Vide Section 2.2.2, p.56.

succeed, the portal required participating SMTEs to collaborate in the creation of content and delivery of other portal services. The *skills* and *capabilities* required for successful collaboration are artefacts of cognitive competence that involve the “ability to perform significant tasks and to solve problems that enable firms to compete effectively and sustainably in markets.” (Koch and Hauknes, 2000, p.3) Such *knowledge* may be explicit, but is more likely to be tacit and *socially* acquired in the context of SMEs (Keeble and Wilkinson, 2000; Braun, 2003). The analysis of how domain specific (E-commerce) *knowledge* and *social capital* functioned to shape human capital formation in the adopter network formed the central task of the network investigation.

Quantitative data gathering focussed on the *relational*, *positional* and *centrality* influence weightings (Valente, 2005) that attached to relations concerning E-commerce information and knowledge interchange in the portal group. Knowledge relations (Ties) used for construction of the sociometric data set describing network interactions were selected on the basis of previous studies that claimed validation of these measures (Borgatti and Cross, 2003; Garton, Haythornthwaite and Wellman, 1997) and other studies that suggested domain validity in an SMTE C-commerce context (Rowe, 2004; La Micela, Roberti and Jacucci, 2003; Braun, 2003). It was concluded from investigation of the literature that Knowledge Capital (KC) resided in the network in the form of ties consisting of E-commerce *knowledge*, the extent to which individuals with this knowledge were *trusted* and *accessible*, and hence the *value* to be placed on this knowledge.

Measures adopted for the analysis are utilitarian and predicated on a view of nodal information and knowledge seeking behaviour grounded in appropriable benefits to nodes from such behaviour. Figure 9.5 describes the tie set and its relationship with social capital and knowledge diffusion. As knowledge capital (Borgatti and Cross, 2003) and social capital (Coleman, 2003) contained in nodes, group of nodes and networks increases, so too does

the *potential* for information and knowledge flows, i.e., the potential for *knowledge diffusion*.



**Figure 9.5 Social capital and diffusion (Brogan, 2005)**

In his Diffusion of Innovation (DOI) Theory, Rogers (2003) argued that the adoption of an innovation, such as the portal, is an action facilitated, firstly, by the extent to which the innovation is perceived to generate benefits that outweigh costs (*ibid*, p.164) and, secondly, as a consequence of the creation of *critical mass* (*ibid*, p.157). Critical mass “occurs at the point at which enough individuals have adopted an innovation so that the innovation’s further rate of adoption becomes self-sustaining” (*ibid*). In essence, on the *supply side*, social and knowledge capital must work to produce a *critical mass* of human capital committed to the adoption of a Cyber transformation C-commerce innovation, if a community is to successfully cluster. The creation of critical mass is determined by *endogenous* social factors such as knowledge and learning (Cross, Parker, Prusak and Borgatti, 2003; Rogers, 2003), normative beliefs (Coleman, 2003; Rogers, 2003) and opinion leadership (Rogers, 2003), as well as *exogenous* factors.<sup>218</sup> Thus, adoption of innovation is partly a social phenomenon, where “in deciding whether or not to adopt an innovation,

<sup>218</sup> Vide Section 2.1.7, p.39.



individuals depend mainly on the communicated experience of others like themselves” (Rogers, 2003, p.149). Adopting Coleman’s (2003, p.58) view that social capital must be translated into human capital for economically significant activity, the transition from social capital to human capital can be seen as a critical one in diffusion of innovation.

Figure 9.6 comprises a *process model* for human capital formation that describes constructs and methods employed in the investigation of the Cape Range Ningaloo portal quasi-experiment *sociometric* data set. The model joins knowledge and social network theory, via processes in human capital formation to C-commerce innovation. The joining of knowledge management theory with sociological and learning theory in this way extends the literature on the contribution made by social factors to E-commerce innovation. The model depicts forms of *KC*, the operation of social networks in the determination of *social capital* and the emergence of economically significant *human capital*. The model draws upon fieldwork outcomes that support a *human capital* interpretation of the phenomenon of E-commerce innovation.<sup>219</sup> Such capital provides the foundation E-intelligence and its translation into E-strategy that shapes activity in the transformation layers described in Figure 9.1.

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<sup>219</sup> Sections 8.3.1-8.3.2 contain domain actor perspectives on education, learning and strategy formation issues.

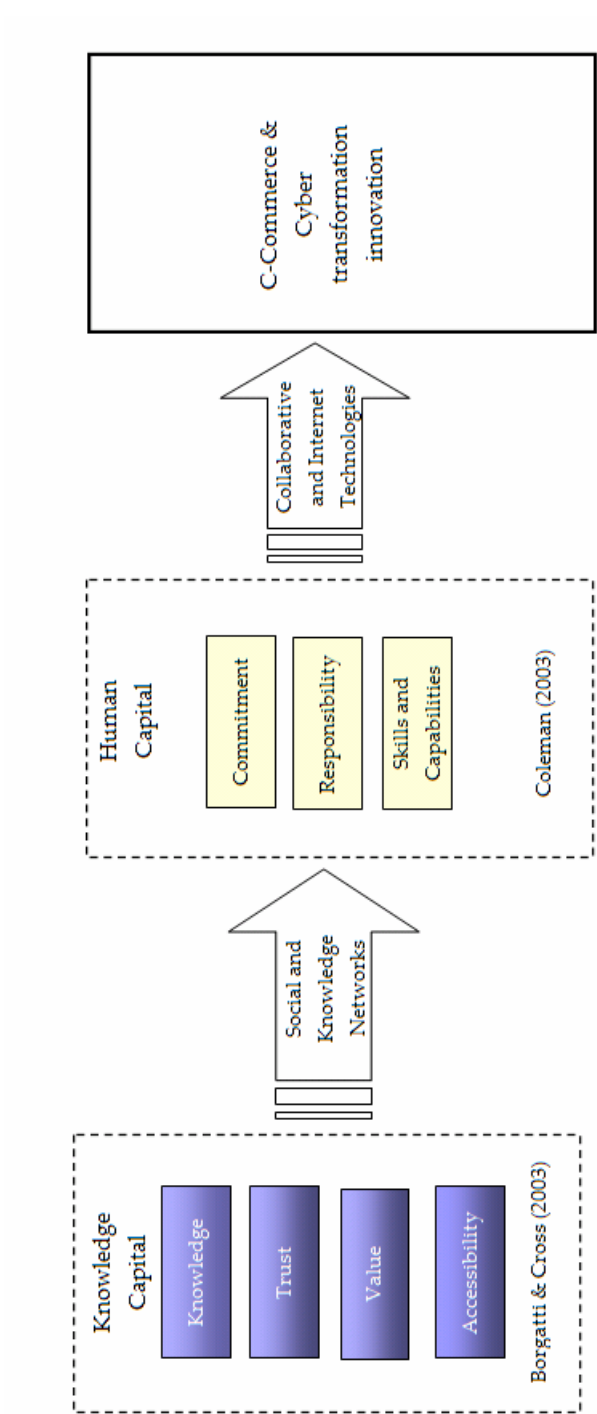


Figure 9.6 Human Capital: C-commerce and Cyber transformation innovation (Brogan, 2005)

In such a process, Rogers (1995) concluded that innovativeness and potential for innovation can be subverted by social phenomena. How did factors such as *knowledge capital*, *social capital* and *network behaviour* work to determine the innovation outcome achieved with the portal quasi-experiment? Conclusions from the data analysis follow, contextualized in terms of the wider literature on C-commerce and innovation theory. The research suggests some heuristics or rules concerning SMTE clustering *recommended* for further investigation. Since these heuristics are grounded in the data analysis, conclusions from the data analysis are discussed first.

#### 9.7.2 Conclusions: Network topology of the Portal Network

Post-trial social network analysis was consistent with the interpretation that *low* innovation potential existed in the portal adopter group. As revealed by tie analysis, the topology of the local area network was found to be *factionalized*,<sup>220</sup> *hierarchical*<sup>221</sup> and to contain clear *isolates*.<sup>222</sup> Factional organization aligned with E-commerce value creation outcomes. *Heterogenous* dyads between owner operators recording superior revenue outcomes and those recording inferior outcomes were uncommon compared with *homogenous* dyads.<sup>223</sup>

A *high proximity, homogenous* type information flow (Granovetter, 1973) was observed in the faction surrounding N3. Interview transcripts showed that nodes in this faction were either unaware or inexperienced in the application of

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<sup>220</sup> Vide Section 8.4.3, p.350.

<sup>221</sup> Vide Section 8.4.2.2, p.335.

<sup>222</sup> *Ibid.*, p.333.

<sup>223</sup> Vide Section 8.4.3, p.350.

E-strategy and E-intelligence,<sup>224</sup> were often despondent about E-commerce and were more inclined to source E-commerce advice from within the local area network.<sup>225</sup> In contrast, the elite group of SMTEs as measured by E-commerce value creation outcomes displayed *low proximity, heterogenous flows* (Granovetter, 1973) involving nodes in the wide area network extending beyond the region.<sup>226</sup> These nodes also operated superior Cyber transformation sites, were adept in the use of E-strategy and manifested E-intelligence.<sup>227</sup> Thus, tie analysis outcomes were consistent with Rogers (1995) interpretations of the respective importance of *homophily* and *heterophily* based on Granovetter's (1973) work on the strength of weak ties. Nodes displaying heterogenous low proximity flows were observed to be more innovative, than nodes not displaying such flows. However, within the local network, the dyadic behaviour of elite nodes is *homophilous*, posing a barrier to knowledge diffusion. In circumstances where elite individuals interact mainly with each other, 'trickle down' to non-elites is dissipated (Rogers, 2003, p.136). As measured by Tie (i), *homophily* was observed in both the elite and non-elite groups, working to limit the diffusion of Cyber transformation ideas.<sup>228</sup>

Analysis of dyads by type also suggested major problems for the portal team in creating the co-operative culture required for the portal to succeed. Tie (i) analysis revealed the uni-directional character of many information flows.<sup>229</sup>

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<sup>224</sup> Vide Section 8.3.3, p.317.

<sup>225</sup> Vide Section 8.4.2.6, p.346.

<sup>226</sup> *Ibid.*

<sup>227</sup> Vide Section 8.3.3, p.322.

<sup>228</sup> Vide Section 8.4.2.6, p.346.

<sup>229</sup> Vide Section 8.4.2.2, p.334.

Low levels of reciprocity were observed with Tie (*t*)<sup>230</sup> and Tie (*k*)<sup>231</sup> data describing a network where *only* slightly better than one third of nodes trusted each other and where members of the elite group displayed no confidence in the E-commerce knowledge of other members of the treatment group. Viewed in the light of existing research describing the importance of trustworthiness to C-commerce adoption (Morgan and Hunt, 1994; Robbins, 2003; Rowe, 2004), Tie (*t*) data on reciprocal ties were particularly discouraging.

#### 9.7.3 Conclusions: Centrality and Position in the Portal Network

The relationship between centrality and *power* and *influence* has been the subject of considerable sociological research (Brass, 1984; Burckardt and Brass, 1990; Krackhardt, 1990; Tushman and Romanelli, 1983; Breiger, 1976; Cross, R., Parker, A., Prusak, L. and Borgatti, S., 2003). Network analysis of nodal *InDegrees* and *OutDegrees* showed the central role played by N3 in the life of the faction consisting of under-performing nodes.<sup>232</sup> Other measures of centrality such as *Betweenness* and *Eigenvectors*, also suggested the centrality of N3.<sup>233</sup> Importantly, inspection of the Tie (*i*) Netview showed the critical position occupied by N3, as a bridge to the elite group via N10. In short, N3's position in the network conferred *power* and *influence*. This power and influence could be exercised in the shaping of normative positions (Coleman, 2003), or in bottleneck or hub behaviour in knowledge diffusion (Cross, Parker, Prusak and Borgatti, 2003).

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<sup>230</sup> Vide Section 8.4.2.3, p.341.

<sup>231</sup> Vide Section 8.4.2.1, p.334.

<sup>232</sup> Vide Section 8.4.2.7, p.347.

<sup>233</sup> *Ibid.*

Relative to the project champion *N2*, *N3* possessed greater *centrality* and superior *position*. Identification of the critical role played in information and knowledge flows by particular nodes, such as *N3*, describes a clear analysis benefit from the application of social network analysis methods. Change managers cannot afford to ignore issues of centrality and position.

#### 9.7.4 Conclusion: Methods for understanding SMTE Network topology

In SMTE clustering, the successful utilization of SNA by change managers involves considerations of methods and tools. This research has applied SNA methods to *sociometric* data that describes Knowledge Capital (*KC*) vested in nodes in a network, within a process model describing human capital formation.<sup>234</sup> Analysis results are *consistent* with the innovation outcome, suggesting the value of the analysis, the model and the role of networks as a CSF in C-commerce adoption, subject to confirmation by further research. Implications for methods concern the concept of nodal Knowledge Capital (*KC*), the significance of dyadic analysis of E-commerce knowledge and information flows and interpretations from both affecting change management.

Knowledge Capital (*KC*) was operationalized around *three* relational characteristics or ties for which Borgatti and Cross (2003, p.440) claimed validation in their study of information seeking behaviour,<sup>235</sup> supplemented by the C-commerce domain specific relational characteristic of *trust* (*t*) (Morgan and Hunt, 1994; Robbins, 2003; Rowe, 2004). A fifth *interaction* (*i*) tie (Garton, Haythornthwaite and Wellman, 2005) described information and knowledge flows in the physical layer.

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<sup>234</sup> Figure 9.6, p.393.

<sup>235</sup> Knowledge (*k*), Value (*v*) and Accessibility (*a*). Vide Section 2.1.10, p.52.

The research derived an *aggregate* view of directed ties in the network in which the *KC* of a node is represented as a collection of tie  $(k)$ ,  $(t)$ ,  $(v)$  and  $(a)$  values. Choose node  $j$  for the tie set  $(k)$ ,  $(t)$ ,  $(v)$  and  $(a)$ :

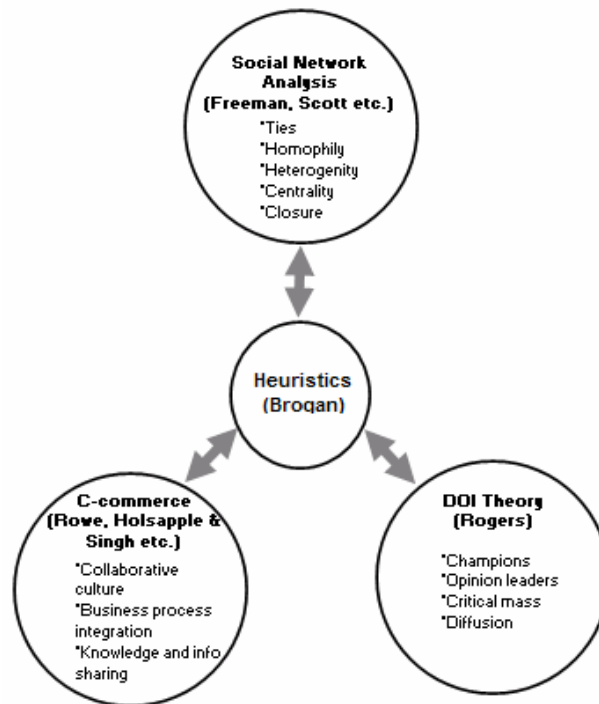
$$KC_{dt} = \begin{pmatrix} k_j = \sum_{i=1}^n K_{ij} \\ t_j = \sum_{i=1}^n T_{ij} \\ v_j = \sum_{i=1}^n V_{ij} \\ a_j = \sum_{i=1}^n A_{ij} \end{pmatrix} \quad \forall j \in 1, n$$

Thus, the *KC* of any node as measured by directed ties can be compared with other nodes by *inspection* of the collection set. The inspection view consolidates the results of columnwise matrix analysis in a usable form. In conjunction with another tool, namely, *heuristics*, inspection results in information about network behaviour that is important to managing change.

Exploration of methodological approaches to the data set also suggested C-commerce domain specific approaches, specifically in connection with trust. Calculated for the network, the Matrix Reciprocity Value (*MRV*) for tie  $(t)$  provided a measure of the extent to which ties are reciprocal or uni-directional. In an optimal setting where all trust ties are reciprocal, *MRV* achieves its theoretical maximum value (1.000). Real world settings involve degradation and networks with low *MRV* present a serious challenge to innovation based on clustering.

#### 9.7.5 Conclusions: Heuristic tools and methods for change managers

The success enjoyed by SNA with the portal quasi-experiment suggests an SMTE derived *network analysis framework* with clear potential to “untangle the effects of the embedded network structure on the diffusion process” (Braun, 2003, p.5). Figure 9.7 describes this framework:



**Figure 9.7 Network Analysis Framework: C-commerce, Social Network Analysis and Innovation Theory (Brogan, 2005)**

For change managers, the framework delivers tools in the form of *heuristics*, that might be applied in the management of change. These heuristics are grounded in portal quasi-experiment analysis outcomes and where relevant are presented with references to the wider innovation and C-commerce research literature. All heuristics are proposed subject to validation by future case study and action research.

*Heuristic 1: Sufficient interaction should exist in an SMTE network as measured by Tie (i) data, to provide a foundation for sustainable clustering.*

Tie (i) descriptive statistics from the portal quasi-experiment revealed low levels of E-commerce information and knowledge interchange overall, i.e., a preponderance of weak ties, and considerable variance in nodal activity levels. Work by Keeble and Wilkinson (2000) on knowledge networking for SMEs, and other work on the importance of networking and local relationships for



successful clustering (McRae-Williams, Lowe, and Taylor, 2005), suggests problems for change managers in networks characterized by poor Tie (*i*) outcomes. In such cases, in the project feasibility stage, the change manager may conclude that the network as measured by interaction summary data is unsuited to clustering, or factor into the project plan initiatives aimed at building a culture of shared action and purpose.

In their portal project, La Micela, Roberti and Jacucci (2003, p.93) responded with a *training plan* that:

- Embedded the notion of the achievement of common goals through collaboration;
- Created a common and shared language on technical and managerial topics such as marketing and management; and
- Highlighted the benefits of ICT tools and cooperative work.

Dyads can be reciprocal or uni-directional, pointing to the potential for Tie (*i*) analysis to provide other valuable information to change managers. For example, analysis of *InDegrees* and *OutDegrees* (Hanneman, 2001) yields a description of sink behaviour in a network, suggestive of the existence of hierarchies. In this context, the Matrix Reciprocity Value (*MRV*) for Tie (*i*) provides a measure of the extent to which ties are reciprocal or uni-directional. *Ucinet* calculated the dyad-based reciprocity in the portal group at 14.29%, i.e., the overwhelming majority of dyads were unidirectional describing a very hierarchical, unbalanced network. Since hierarchy confirms nodes in normative behaviour (Coleman, 2003; Rogers, 1995), the change manager may decide that the network has low potential for clustering or pursue remedial strategy.

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*Heuristic 2: Sufficient closure should exist in an SMTE network, as measured by Tie (i) data to provide a foundation for sustainable clustering.*

Coleman (2003) provides sociological evidence of the implications of isolates and non-closure for community building. As Coleman notes (*ibid*, p.66), the development of new normative positions is negatively impacted by significant levels of non-closure. Analysis of directed Tie (*i*) data in the form of *InDegrees* and *OutDegrees* allows change managers to move beyond subjective observation to the empirical evidence of isolation. In the portal quasi-experiment, 25% of the adopter cohort was unconnected to the local area network for E-commerce knowledge and information interchange as measured by *InDegrees* and *OutDegrees*, describing a high proportion of isolates. In common with *Heuristic 1*, the change manager must decide whether network closure is conducive to clustering with or without remediation, or whether the network is not a suitable candidate for clustering on the basis of this criterion.

*Heuristic 3: The significance of any instance of isolation can be viewed with reference to the KC quadruple.*

The inspection view of the KC set describes Tie (*k*), (*t*), (*v*) and (*a*) directed tie values for each node in the network. KC enjoyed by a node can be compared with other nodes via the inspection view. In the case of the portal quasi-experiment, application of *Heuristic 3* points to a significant isolate in *N1*, a node that is trusted and whose expertise enjoys wide network recognition as measured by Tie (*k*). Fieldwork revealed *N1* to be an elite performer in terms of E-commerce value creation and the operator of a superior Cyber transformation site.<sup>236</sup> Since work by Keeble and Wilkinson (2000) emphasizes

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<sup>236</sup> Vide Section 8.3.4, p.324.

the importance of tacit knowledge repositories for successful SME clustering, important omissions as described by isolates, weakens tacit knowledge capital and, hence, clustering potential. The change manager must weigh the consequences for clustering of high prestige, expert isolates.

*Heuristic 4: Sufficient aggregate trust should exist in an SMTE network, as measured by reciprocal Tie (t) data to provide a foundation for sustainable clustering.*

In regional clustering of SMTEs for C-commerce using shared infrastructure solutions, this research suggests that assessment of project feasibility should involve *calculations* of trust in the network of potential adopters. The decision by a node to collaborate with other nodes in a cluster involves an assertion of trust in others nodes, a relation which ideally is *reciprocated*. Trust also determines a node's preparedness to admit a lack of knowledge or expertise to other nodes in a network and commit to a process of learning (Cross, Parker, Prusak and Borgatti, 2003) paving the way for diffusion and adoption of innovation. Trust is an acknowledged CSF drawn from the wider research oriented literature on C-commerce adoption and social network analysis (Rosenfeld, 1997; Braun, 2003; Rowe, 2004; Huxham and Vangen, 2000; Håkansson, H., and Snehota, 1995; Krackhardt, 2000).

In the calculation of trust, the vector character of Tie (t) data and the idea of reciprocity provide the foundations of methods for analysis. The Matrix Reciprocity Value (MRV) for Tie (t) is a measure of the extent to which ties are reciprocal or uni-directional. Dyad based reciprocity<sup>237</sup> was measured at 0.3793 in the portal local area network, meaning that only 37.93% of all nodes, or slightly better than one third of nodes trusted each other. Such a low threshold of reciprocal trust posed a barrier to the growth of collaborative

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<sup>237</sup>  $\text{Num}(X_{ij}>0 \text{ and } X_{ji}>0)/\text{Num}(X_{ij}>0 \text{ or } X_{ji}>0)$

culture, *critical mass* adoption of the portal and, hence, successful clustering. Application of *Heuristic 4* in the assessment of project feasibility, might lead to rejection of networks outright as possessing in-sufficient reciprocal trust for clustering or the application of tactics aimed at building trust.

*Heuristic 5: In the selection of opinion leaders and champions, directed Tie (t) data should be used in the first instance as a basis for screening.*

Nodes that do not conform with system norms for reasons of innovativeness or other *endogenous* domain specific reasons are not *trusted* by other nodes. Application of *Heuristic 5*, would have excluded *N2* from consideration as a potential champion and opinion leader. *N1*, *N3* and *N10* present as better candidates by aggregate directed Tie (*t*) data. In his Diffusion of Innovation theory, Rogers (2003, p.142) drew attention to the dangers inherent in change agents selecting opinion leaders that are “too innovative”:

Innovators are poor opinion leaders in systems with traditional norms: They are too elite and too change oriented.

The perception of a node by other nodes as “too innovative”, furnishes one of many reasons for why a node may be distrusted by other nodes in a network. Review of *N2*’s interview transcript suggests a highly factionalized adopter community in which domain actor’s parochialism and self-interest undermine trust and frustrate innovation:

*N2*: The business community here is working to delay development, maintain monopoly and resist innovation. I was active in a number of local institutions for business and tourism stakeholders but I now view these as corrupt.

Rogers (2003) believed that in selecting opinion leaders ‘the norms of the system’ (*ibid*) were more important, than perceived ‘innovativeness’. The available data does not allow judgement on whether *N2*’s lack of credentials as a champion as measured by directed Tie (*t*) data is the product of perceived innovativeness in a system with a more traditional norm, or other factors. However, Krackhardt’s (2003, p.103) observations about the combination of

weak ties and trustworthiness are noteworthy in discussion of N2's value as a change agent:

"If change were simply dependent on new information, then weak ties would be pre-eminent. But when it comes to major change, change that may threaten the status quo in terms of power and the standard routine of how decisions are made, then resistance to that change must be addressed before predictions can be made about the success of that change effort. A major resource that is required to bring about such a change is trust in the propagators of that change. Change is the product of strong, affective and time honoured relationships."

The evidence suggests that directed Tie (*t*) screening should be used in the selection of champions and opinion leaders.

*Heuristic 6: Subject to 5, the selection of opinion makers and champions should be further filtered on the basis of power and influence as measured by interaction, centrality and position.*

How interaction, centrality and position contribute to the exercise of *power* and *influence* in a network has been the subject of considerable sociological research (Brass, 1984; Burckardt and Brass, 1990; Krackhardt, 1990; Tushman and Romanelli, 1983; Breiger, 1976; Cross, R., Parker, A., Prusak, L. and Borgatti, S., 2003). In contrast to N2, N3 is a highly trusted node with equal highest columnwise Tie (*t*) aggregate score.<sup>238</sup> Inspection of Tie (*v*) data shows that N2's problems with directed trust ties translate into a low mean value in terms of the information and knowledge provided to other members of the network.<sup>239</sup> Information sourced from N3 on the other hand is highly valued.<sup>240</sup> Inspection of the KC set shows that N3 enjoys superior capital compared with all other nodes in the network. Calculation of *Freeman's Degree*

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<sup>238</sup> Vide Section 8.4.2.3, p.341.

<sup>239</sup> Vide Section 8.4.2.2, p.335.

<sup>240</sup> *Ibid.*

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*Centrality Measure, Degree, Betweenness and Eigenvector* (Hanneman, 2001) scores all point to the central position occupied by *N3* in the network.<sup>241</sup> *N3* also displays power and influence as a bridge to the elite group via *N10*, and as leader of a hierarchical faction inclusive of under-performing nodes. In brief, centrality calculations and capital vested in *N3* as measured by the compound relation *KC*, point to *N3*'s greater potential as an opinion leader and change agent. However, examination of the interview transcript showed *N3* *not* to be innovative, but committed to a position that down-played innovative technology in favour of established practices.<sup>242</sup> The key to unlocking *N3*'s potential as a change agent and opinion maker can be found in fieldwork and *N5*'s observation that *N3* was not opposed to the portal project, but required incentives to commit to the project.<sup>243</sup>

*Heuristic 7: Homophily and heterogeneity in SMTE network topology are important determinants of tactics in change management*

Rogers (1995) and Granovetter (1973) interpret innovativeness in networks in terms of *homophily* and *heterophily* based on the character and strength of ties. Specifically, Rogers (2003, p.174) observed that the innovation potential of nodes was negatively related to their degree of *proximity* and *homophily*. Conversely, (*ibid*) in an expression of Granovetter's (1973) theory on the "strength of weak ties", low proximity, *heterophilous* ties display greatest innovation potential. Roger's generalizations accord with the data analysis. Inspection of the wide area network data shows that *N2* has most ties outside the local area network. These ties are weak in strength as measured by Tie (*i*)

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<sup>241</sup> Vide Section 8.4.2.7, p.347.

<sup>242</sup> Vide Section 8.3.3.2, p.322.

<sup>243</sup> Vide Section 8.3.2, p.316.

and display *heterophily*. Interview and observational data revealed N2 to be highly *innovative*. In comparison, N3 had no *heterophilous* wide area network ties and local ties are uni-directional, *homophilous* and relatively strong as measured by interaction.<sup>244</sup> Interview and observational data revealed N3 to be less innovative. More importantly, observations about the character and strength of ties suggest the power of N3 in terms of network *norm* formation (Coleman, 2003; Rogers, 1995) and *hierarchy* (Coleman, 2003; Cross, Parker, Prusak and Borgatti, 2003). Results from tie analysis underpin the requirement for change management to account for the power and influence exercised by nodes such as N3 over normative beliefs and commitment to change in C-commerce clustering.

The existence of a faction displaying extreme *homophily* also suggests the nodal targeting of training action and resources (La Micela, Roberti, and Jacucci, 2003) to produce new ways of thinking and acting that furnish the human capital necessary for clustering.

*Heuristic 8: Consideration should be given to boundaries in interpreting results from network analysis*

How boundaries are drawn in network analysis contributes to analysis outcomes (Carrington *et al.* 2005, p.3). In the analysis of the portal quasi-experiment, research design attempted to account for this by aiming to be inclusive of both the local and wide area of networks of E-commerce knowledge and information interchange. However, since permission to interview nodes outside the local area network was not forthcoming, wide area network data gathering was restricted to Tie (*i*) analysis and largely confined to dyad strength and direction. As the analysis demonstrates, much

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<sup>244</sup> Vide Section 8.4.2.2, p.335.

can be achieved from what is predominantly a local area network analysis, however, boundary considerations must be weighed in assessing network analysis outcomes. The propensity for nodes connected to N3 to source E-commerce advice locally was observed in the portal adopter group, suggesting basic reliability in the analysis performed.

*Heuristic 9: In SMTE C-commerce change management, meaning attributed to network analysis should incorporate results from fieldwork.*

In this social network analysis, the dialogue between *fieldwork* involving observation and interview and empirical analysis has been substantive, pointing to a logical partnership between *empirical* and *interpretive* methods in the conduct of network analysis. Further, as a consequence of Heuristic 8, triangulatory precautions may be required against unreliability in SNA, suggesting the role of *fieldwork* in interpreting network analysis results. Heuristic 9 finds support in the wider literature on social network analysis. For example, Cross, Parker, Prusak and Borgatti (2003, p.229) argue that only interviews can yield full understanding of the significance of nodal *centrality*. The phenomenon of *high prestige isolate* for example, is also best revealed and understood from fieldwork data. Likewise, fieldwork elucidated the *value* positions (Rogers, 1995) held by N3 and N10 on E-shops and innovative technology in E-commerce, suggesting the significance of *positional* and topological findings from empirical analysis of the network.

#### *9.7.6 Conclusions: The role of networks in diffusion of shared (C-commerce) Cyber transformation innovation*

In conclusion, firstly, network adoption outcomes for the portal quasi-experiment were found to be *consistent* with an important proposition from innovation theory, namely, that response to an innovation stimulus, is in part *socially* determined (Freeman, 1991; Rogers, 1995). Secondly, it was found that a notion of Knowledge Capital grounded in perceived *expertise* and



*trustworthiness* could be used in conjunction with social network analysis methods to provide a credible explanation of the network's response to the Cyber transformation/C-commerce innovation type stimulus applied to the system. The study concludes that Knowledge Capital may be captured as the KC *quadruple* that represents as a compound relation the E-commerce expertise of individual nodes in a network as perceived by other nodes based upon the ties of *knowledge*, *trust*, *value* and *accessibility*, i.e., for any node  $j$  in  $k$ ,  $t$ ,  $v$  and  $a$ ,  $KC_j =$

$$\left( \begin{array}{l} k_j = \sum_{i=1}^n K_{ij} \\ t_j = \sum_{i=1}^n T_{ij} \\ v_j = \sum_{i=1}^n V_{ij} \\ a_j = \sum_{i=1}^n A_{ij} \end{array} \right)$$

The study is therefore supportive of work by Rosenfeld's (1997) and Swann *et al.* (1997) on the importance of *social capital* and *trust* in clustering. The study further suggests that knowledge capital is an important determinant of individual response to an innovation stimulus. Knowledge capital is essentially *utilitarian* in character and can be appropriated for profit (Nonaka and Takeuchi, 1995). The research also shows that judgements made by other nodes about where expertise resides in a network, are not always perfect suggesting the role of other *endogenous* factors such as learning (La Micela, Roberti, and Jacucci, 2003) in nodal behaviour.

The KC *quadruple* provided the basis for dyadic analysis of knowledge and information flows in the portal adopter network. Methods applied were drawn from the field of SNA involving the constructs of *ties*, *dyads*, *reciprocity*, *centrality*, *social norms*, *obligations* and *closure* (Breiger, 2004 ; Coleman, 2003; Adler and Kwon, 2002; Krackhardt, 2000). Flows were further analysed in

terms of the mainstream innovation theory constructs of *homophily*, *heterogeneity* and *strong* and *weak* ties (Granovetter, 1973; Rogers, 1995). The combination of analysis methods based on sociological discourse, empirical network analysis and innovation theory, suggested a *network analysis framework*.<sup>245</sup> Network analysis outcomes were also interpreted in terms of fieldwork data in the form of interviews and observations. Success enjoyed with application of these methods, suggested the possibility of *heuristics* or rules that could be used by change managers involved in SMTE C-commerce clustering, subject to further research aimed at validation. Importantly, the matrix method of measuring social capital that accrues to nodes based on the domain specific ties of *knowledge*, *trust*, *value* and *accessibility*, offers the promise of more reliable identification of champions and opinion leaders, an important source of catalysis and an acknowledged CSF in technology based innovation. As Rogers (2003, p.140) declares “the most influential opinion leaders are key targets for the efforts of change agents.”

Figure 9.8 evolves the social process model of Figure 9.6 as an explanation of SMTE C-commerce *change management* inclusive of the network analysis framework describe in Figure 9.7. The diagram depicts social process enablers from previous studies including learning and community building (Braun, 2003; La Micela, Roberti and Jacucci, G., 2003). Coleman’s (2003) ideas on human capital formation provide the basis of structure. The model presents a view of socially constructed *endogenous* factors, and hence, comprehensive understanding of C-commerce innovation requires consideration of *exogenous* factors discussed elsewhere in the thesis.<sup>246</sup>

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<sup>245</sup> Vide Figure 9.7, p. 398.

<sup>246</sup> Vide Section 2.1.7, p.43.

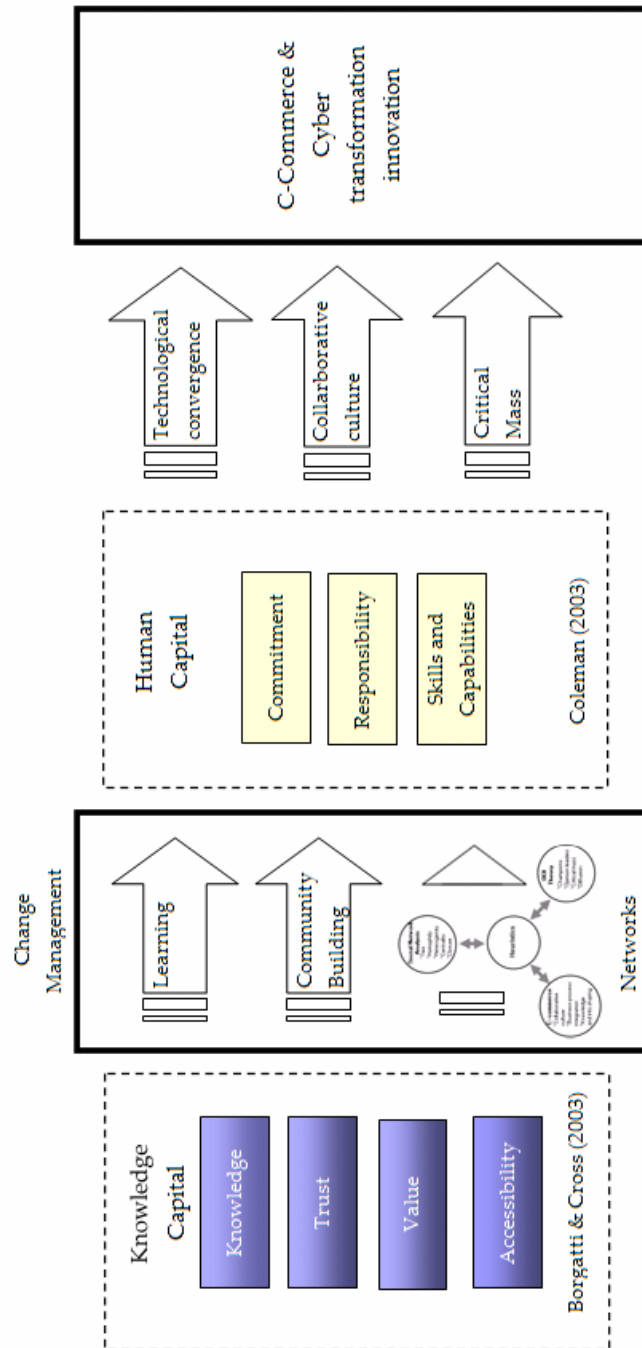


Figure 9.8 Social Process Model for the C-commerce Change Management Domain (Brogan, 2005)

For regional clustering of SMTEs around advanced transformation C-commerce platforms, network analysis logically should occur in the project feasibility and planning phase before any resources are budgeted or committed.

#### *9.7.7 Limitations on network analysis findings and directions for future research*

Findings from the investigation have suggested the role of networks in SMTE C-commerce adoption and how change managers might manage network effects to improve innovation outcomes. However, it is important to acknowledge limitations of findings. Results are based on one case study, the portal quasi-experiment, a small network consisting of twenty four local and wide area network nodes. In common with the discussion of research results presented elsewhere in the thesis, a claim of true usefulness concerning findings on the role of networks should only proceed from *replication, extension* and *generalization* (Sanathanam and Hartono, 2003, p.126). It is therefore premature to proclaim the value of the quadruple and social network analysis methods in understanding SMTE networks. For such a model to be realistically useful, validation studies are required involving other industries and sectors. Utilizing action research methods, further research is required into the adequacy and comprehensiveness of proposed heuristics.

In discussion of limitations and directions for future research, it is also important to remember that the measurement of capital in the study involves *redaction* in terms of *all* the relations that might describe nodal interaction. In this respect, the current study is subject to Carley's (2003) and Skillicorn's (2004) much broader criticism of SNA as bound up by relatively small networks characterized by a few relations. Selection of relations in the current study describes a *rational* and *utilitarian* view of information and knowledge interchange. The decision to seek information or knowledge is inherently rational, based on perceptions of expertise and the appropriable character of information or knowledge obtained through interaction.

However, in their account of the role of social psychology in C-commerce, Rowe *et al.* (2005, p.8) suggest that node behaviour may be fundamentally determined by issues of *social identity*. Social identity theory (*ibid*) posits a concept of the 'social self' that determines propensity and willingness to enter into social systems such as C-commerce. Where social identity is poorly formed, individual identity prevails posing a barrier to collaboration. Thus, social identity theory suggests the role of social psychology in nodal behaviour, an alternative view to that provided by the utilitarian construction of network behaviour. If Rowe's proposition is correct, then the utilitarian and sociological discourse that underpins this study requires revision if it is to provide a more comprehensive explanation of the social domain in C-commerce adoption.

Within the context of the current study, conceived and executed within a small SMTE case study context, *no* claim can be made as to the true value of network analysis in understanding diffusion of innovation, and its power as a tool in the armoury of SME C-commerce incubators and change managers. Results from this study are encouraging and suggest the value of these methods, but much remains to be explored in the social domain of C-commerce Cyber transformation innovation.

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## Appendix I: B2C Cyber transformation Scale

1-6 Technological capability transformation	
1. PoP type	<input type="checkbox"/> 1.1 Portal <input type="checkbox"/> 1.2 Web site <input type="checkbox"/> 1.2.1 Registered domain 1.3 Portal count .....
2. Architecture	
	<input type="checkbox"/> 2.1 Server resident/Client Pull (0) <input type="checkbox"/> 2.2 Peer to Peer (1)
	<input type="checkbox"/> 2.3 Server resident/ Client Pull (Forms enabled client data acquisition) (1)
3.1 Enabling Internet technologies	<input type="checkbox"/> 3.1.1 Static HTML (0) <input type="checkbox"/> 3.1.2 DHTML (1)
	<input type="checkbox"/> 3.1.3 XML (1) <input type="checkbox"/> 3.1.4 Scripted DBMS (1)
3.2 Discovery (Search Engine Visibility)	
3.2.1 Metadata	<input type="checkbox"/>
3.2.2 L2S (Unique links to this site from other sites as measured by a Google link site URL search. Percentage Rank.)	.....
3.2.3 PageRank (Google) (1-10)	.....
3.2.4 AlltheWeb (Percentage Rank)	.....
3.2.5 Alexa Traffic Ranking	.....
4. Interaction/Simulation	
4.1 Immersive Interaction/Simulation -Flash/ QT(VR)	<input type="checkbox"/>
4.2 Form interaction	<input type="checkbox"/>
5 Channels	
5.1 Browser (Fixed connection)	<input type="checkbox"/>
5.2 Mobile	<input type="checkbox"/>



5.2.1 WAP	<input type="checkbox"/>
5.2.2 GPRS	<input type="checkbox"/>
5.2.3 3G	<input type="checkbox"/>
5.3 Facsimile	<input type="checkbox"/>
5.4 VoIP	<input type="checkbox"/>
6. Multimedia	
6.1 Video	<input type="checkbox"/>
6.2 Streaming media	<input type="checkbox"/>
6.3 Animation/Sound	<input type="checkbox"/>
I/CT Score->	
7-8 Business transformation	
Product transformation	
7.1 Online directory of products/services	<input type="checkbox"/>
7.2 Online product/service customization	<input type="checkbox"/>
7.3 Customer input to specification and design	<input type="checkbox"/>
Promotion transformation	
7.4 Online paid advertising	<input type="checkbox"/>
7.4.1 Banners	<input type="checkbox"/>
7.4.2 PopUps	<input type="checkbox"/>
7.4.3 Affiliate	<input type="checkbox"/>
7.5 Online discounting and offers	<input type="checkbox"/>
7.6 Online promotion customization	<input type="checkbox"/>
7.7 Customer participation in online	<input type="checkbox"/>

promotion (Word of mouth etc.)	
7.8 Online promotions partnering (Alliances)	<input type="checkbox"/>
7.9 Branding/Accreditation	<input type="checkbox"/>
7.10 Internet direct marketing	<input type="checkbox"/>
Pricing transformation	
7.11 Online prices	
7.11.1 Online prices	<input type="checkbox"/>
7.11.2 Dynamic customization of prices	<input type="checkbox"/>
7.11.3 Online price negotiation(E-markets)	<input type="checkbox"/>
Place transformation	
7.12 Online ordering	<input type="checkbox"/>
7.13 Online fulfilment	<input type="checkbox"/>
BT Score->	
8. Customer relations transformation (Personalization, Community)	
8.1 Online customer service	<input type="checkbox"/>
8.2 Online customer identification	<input type="checkbox"/>
8.3 Online customer tracking	<input type="checkbox"/>
8.4 Personalisation	<input type="checkbox"/>
8.4.1 Languages	<input type="checkbox"/>
8.4.2 Personalised view (eg Bandwidth )	<input type="checkbox"/>
8.5 Community	
8.5.1 Forums	<input type="checkbox"/>
8.5.2 Guestbooks	<input type="checkbox"/>

8.6 Trust	
8.6.1 Privacy policy	<input type="checkbox"/>
8.6.2 Site certificate	<input type="checkbox"/>
8.6.3 Secure transactions (SSL)	<input type="checkbox"/>
8.6.4 Ethics: Environment management plans and/or impact statements	<input type="checkbox"/>
8.7 Relations and feedback	
8.7.1 Feedback (Mail To/Form etc)	<input type="checkbox"/>
8.7.2 VoIP	<input type="checkbox"/>
8.7.3 Communication (e-newsletters)	<input type="checkbox"/>
8.7.4 Communication (Offers and releases)	<input type="checkbox"/>
CRT Score->	
9. Usability	
9.1 User mental map	<input type="checkbox"/>
9.2 Download optimisation	<input type="checkbox"/>
9.3 Logical Information architecture	<input type="checkbox"/>
9.4 Consistent interface	<input type="checkbox"/>
9.5 Efficient navigation	<input type="checkbox"/>
9.6 User control	<input type="checkbox"/>
9.7 Site operational functionality	<input type="checkbox"/>
9.8 Standard use of technology	<input type="checkbox"/>
9.9 Efficient e-commerce transactions	<input type="checkbox"/>
USA Score->	

## Appendix II: E-commerce Adoption Survey

The following questions are intended to describe your firm's experience with Internet E-business.

*All data gathered is treated confidentially and questionnaires are destroyed following aggregation of data.*

### 1. Firm profile

1.1 Number of employees?

1-4

☐

5-19

☐

20-99

☐

100+

☐

1.2 Turnover

\$.....

1.3 Market capitalization

\$.....

1.4 Net assets

\$.....

### 2. Collection period

2.1 Please specify the *financial year* to which the data relate:

July 20.....

June 20.....

### 3. Mode of operation

3.1 Some operators are distributors of retail product, some do Business-to-Consumer (B2C) direct and some do both. Click the mode(s) of business in which your firm is involved:

3.1.1  
Retail  
Only  
(B2B)

☐

3.1.2  
Consumer Direct  
Only  
(B2C)

☐

3.1.3  
Mix (Retail/B2C)  
(B2B/B2C)

☐

3.2 What percentage of your business revenues is retail v. consumer direct?

3.2.1 % Retail %.....

3.2.2 % Consumer direct %.....

#### 4. Internet E-Business value

4.0 Authentication code (Please input the 5 digit authentication code sent to you in the mail)	.....	
4.1 Percentage (%) of revenue generated online		<input type="checkbox"/> Not available
4.1.1 Retail	..... (%)	<input type="checkbox"/> Not available
4.1.2 Consumer direct	..... (%)	<input type="checkbox"/> Not available
4.2 Revenue per employee in this financial year generated online (All modes)	..... (\$)	<input type="checkbox"/> Not available
4.3 Percentage (%) of online supply procurement in this financial year	..... (%)	<input type="checkbox"/> Not available
4.4 Percentage (%) of new customers acquired online during this financial year (Consumer direct)	..... (%)	<input type="checkbox"/> Not available
4.5 Percentage (%) of existing customers doing business online during this financial year	..... (%)	<input type="checkbox"/> Not available
4.6 Sales leads (requests for information) received online each month (Consumer direct from Web site)	.....	<input type="checkbox"/> Not available
4.7 Return on Investment (this collection period)		
4.7.1 Calculation done?		
4.7.2 Result % ROI = $\frac{\text{benefits} \times 100}{\text{costs}}$	..... (%)	<input type="checkbox"/> Not available

## 5. Impact on competitiveness

5. Rate the impact of E-business on your company's *competitiveness* through:

Value criterion	None	Low	Moderate	High	Very High	N/A
5.1.1 Cost reduction	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5.1.2 New customers	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5.1.3 Customer relationships enhancement	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5.1.4 Operational efficiency	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5.1.5 Enabling beneficial alliances or collaborations	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5.1.6 Enabling entry into new markets	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5.1.7 Increased revenue earned per employee	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5.1.8 Improved return on assets	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

## 6. E-business investment

6.1 Please describe your firm/organization's *establishment budget* for Internet E-business (B2C activity only):

<\$5000	\$5000-15000	\$15001-25,000	\$25,001-\$50,000	>\$50,000
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

6.1.2 Please estimate the number of years spanning your involvement with online .....

6.2 *Budget* In the surveyed financial year

<\$5000	\$5000-15000	\$15001-\$25,000	\$25,001-\$50,000	>\$50,000
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

## 7. Investment horizons

7.1 Based on the experience of my firm, I would say the *time horizon* to obtain *pay back* on B2C e-business investment is:

< 1 year	<2 years	3-5 years	6-10 years	> 10 years	Never
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

## 8. E-strategy: Adoption

	Yes	No
8.1 Does your firm have a formal strategy for doing business online?	<input type="checkbox"/>	<input type="checkbox"/>
8.2 If Yes, is this e-strategy integrated with your firm's business strategy?	<input type="checkbox"/>	<input type="checkbox"/>

## 9. E-strategy: Promotion

	Yes	No
9.1 Does your firm advertise online?	<input type="checkbox"/>	<input type="checkbox"/>
9.2 Do you offer discounts and special offers to online customers?	<input type="checkbox"/>	<input type="checkbox"/>
9.3 Is there any promotion customization?	<input type="checkbox"/>	<input type="checkbox"/>
9.4 Can customers participate in online promotions?	<input type="checkbox"/>	<input type="checkbox"/>
9.5 Do you have affiliate arrangements with other businesses allowing you to advertise on their site?	<input type="checkbox"/>	<input type="checkbox"/>
9.6 Do you employ branding and accreditation	<input type="checkbox"/>	<input type="checkbox"/>
9.7 Do you use Internet direct marketing	<input type="checkbox"/>	<input type="checkbox"/>

If you answered Yes to 9.1, what kinds of advertising do you use?

	Yes	No
9.8 Banners	<input type="checkbox"/>	<input type="checkbox"/>
9.9 PopUps	<input type="checkbox"/>	<input type="checkbox"/>
9.10 Affiliate	<input type="checkbox"/>	<input type="checkbox"/>

## 10. E-strategy: Web metrics

The following tables describe various kinds of reports or metrics that might be used to analyse the performance of your Web site.

	Yes	No
10.1 Are Web metrics used?	<input type="checkbox"/>	<input type="checkbox"/>

If your firm uses Web metrics, please answer the following questions about them:

Overview of web metrics	Yes	No	Don't Know
10.2 My ISP provides me with regular reports	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10.3 I have my own analysis software	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10.4 I identify users of my site	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10.5 I track the behaviour of users on my site	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Metrics by type:	Yes	No	Don't Know
10.6 Referrer log analysis- These reports identify referrer site by URL	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10.7 Access logs- These reports are used to analyse visits and visitor behaviour	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10.8. Unique visitors- This report describes the number of unique visitors to my site	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10.9 Clickthrough rates-This report describes how many successive screens of information Web visitors clicked through to reach a particular page	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10.10 Conversions (Completed transactions)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10.11.Drop off-rates (Abandoned transactions)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10.12 Other	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



<b>Available Metrics for my site (Last TWO report periods)</b>	<b>1 Begin (Date)</b>	<b>1 End (Date)</b>	<b>1 Total</b>	<b>2 Begin (Date)</b>	<b>2 End (Date)</b>	<b>2 Total</b>
10.13 Attraction- Total number of visits to my home page (impressions)						
10.14 Attraction-Number of UNIQUE visitors to my site						
10.15 Attraction-Total time spent viewing Web pages (ALL visitors)						
10.16 Attraction- Total pages viewed (ALL visitors)						
10.17 Attraction- Total downloads by volume (Mb, Gb etc)						
10.18 Abandonment- When a customer initiates an expression of interest but abandons it (% or number)						
10.19 Acquisition- Number of prospective customers whose identities were captured						
10.20 Acquisition- Number of prospective customers expressing interest by email or some other overt action						
10.21 Conversion- Number of prospective customers (5.20) who were converted to a sale						
10.22 Clickthrough rate- How many successive screens of information Web visitors clicked through to reach a particular page						
10.23 Loyalty (Duration)- Total time spent viewing Web pages (5.15), divided by the number of visits (5.13)						
10.24 Loyalty (Duration)- Average time spent by users viewing web pages						
10.25 Loyalty-Returning visitors to my site (Expressed as a % or number)						
10.26 Recency- Elapsed time since a customer has recorded a customer action such as a visit or purchase.						
10.27 Other (Please describe)						

**11. Rated overall satisfaction with revenue generated from online**

11.1 Use the following scale to rate your *satisfaction* with the performance of your business in terms of revenue generated from B2C online (Pick the category that best represents your satisfaction level):

Extremely  
Dissatisfied

☐

Dissatisfied

☐

Neutral

☐

Satisfied

☐

Extremely  
Satisfied

☐

*-Thank you for your cooperation!*

*Please return this survey form to:*

*Mr Mark Brogan,*

*School of Computing, Information and Information Sciences,*

*Edith Cowan University,*

*Bradford St,*

*Mt Lawley WA 6050-*