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A dynamic model of e-business strategies for ERP enabled organisations

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Abstract

Purpose – This paper presents a dynamic model for e-business strategy derived from the results of a longitudinal analysis of enterprise resource planning (ERP) enabled organisations.

Design/methodology/approach – This involved a study of 11 international ERP-enabled organisations over a four-year period using multiple interviews and extensive secondary data collection. Three separate research models were used to analyse different stages of e-business growth and the results of this multi-stage analysis consolidated into a staged model of e-business transformation (eBT).

Findings – The model focuses on realising the benefits of B2B interaction through the alignment of ERP with different e-business strategies, increasing emphasis on employee empowerment and successful management of value alliances.

Research limitations/implications – The findings provide practical guidance to managers implementing e-business systems through integrated ERP implementations.

Originality/value – The study demonstrates the application of a comprehensive research model based on three previously validated research frameworks for e-business strategy.

Keywords Electronic commerce, Resource management, Competitive strategy

Paper type Research paper

Introduction

Successful twenty-first century organisations will typically have embraced enterprise resource planning (ERP) systems to integrate e-business processes within the organisation and to underpin the creation of integrated interorganisational systems. This frequently results in new business processes, organisational structures, human resource skill requirements, management roles and knowledge management systems (Robey *et al.*, 2002; Chang *et al.*, 2003; Ash and Burn, 2003; Okrent and Vokurka, 2004; McAdam and Galloway, 2005). To be successful in this new climate, however, organisations have to learn new approaches to planning for collaborative systems and to manage e-business enabled cycles of innovation (Wheeler, 2002; Zahra and Gerard, 2002). Few studies have explored the dynamics of e-business strategic planning and scant information is available on how to implement new paradigms successfully and how to ensure more effective e-business performance as a result (Damanpour, 2001; Kallio *et al.*, 2002).

This paper reports on the findings from multiple case studies of e-business projects in ERP enabled organisations. Each organisation was investigated in a three-stage study over four years, using three theoretical models of e-business implementations to evaluate facilitators and inhibitors of success. The key findings from each case study were captured into a staged model for e-business governance and related to a dynamic strategic planning model that can be applied across all stages of growth of the extended enterprise.



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Strategic planning for e-business

Fahey *et al.* (2001, p. 890) state:

e-business embodies the most pervasive, disruptive, and disconcerting form of change: it leaves no aspect of managing organisations untouched, it challenges long-accepted business models, and organisation leaders have little to draw on from their past experience to manage its effects. In particular, its capacity to transform business processes is no longer in dispute. – Senior executives – thus confront a central challenge: how should they endeavour to capture, analyse, and project the transformational impact of e-business on their organisation's most critical or core processes?

Existing planning models are unequal to this task (Riggins, 1999; Pant and Ravichandran, 2001; Coltman *et al.*, 2001). Planning for such systems has to encompass capabilities for managing, measuring and evaluating organisational capabilities to create value across the network of alliances and hence requires evolutionary approaches which can be tailored to organisational needs at different stages of e-business growth (Wheeler, 2002; Burn and Ash, 2004; McAdam and Galloway, 2005). This whole process is sometimes encompassed within a radical business process re-engineering programme but must also include a rethink of strategic planning processes, change management processes and accountability and return on investment (Patel, 2002; Kallio *et al.*, 2002; Ho *et al.*, 2004; Zhao, 2004). Planning cannot take place in isolation and must encompass all aspects of the emergent learning organisation in virtual networks of value alliances. This includes an examination of assets, resources and competencies to align e-business strategies with corporate strategy and relate the outcomes to corporate productivity (Chang *et al.*, 2003).

In order to study this environment in detail the authors embarked on a longitudinal study of e-ERP based organisations over a four-year period. The 11 organisations were visited three times during this period and a minimum of three interviewees participated on each visit. The structured interviews were focused on three separate models of e-Business Change (eBC) to investigate different aspects of e-business governance and the results from these investigations brought together into a dynamic planning model for e-business governance. The use of three research models was specifically intended to give breadth to the study and allow the incorporation of a variety of strategic views, which informed the planning process.

Theoretical framework

Figure 1 shows e-business implementations from the perspective of three strategic theories: *Virtual Organising*, *eBC*, and *Benefits of B2B*, where:

- (1) Virtual Organising strategies provides a model of e-business evolution. Progress is along the three dimensions of customer interaction, asset configuration, and leveraging knowledge (Venkatraman and Henderson, 1998).
- (2) eBC is illustrated by a model in which progress is across 11 interrelated components based on relevant research in the areas of organisational change, strategic management innovation, and information systems evaluation (Guha *et al.*, 1997).
- (3) Strategies for e-business relates to a model in which e-business activity is correlated against e-business benefits within a set of B2B models (Business to Employee, Business to Customer, Business to Supplier) (Carlson, 1995).

Figure 1.
Three views of e-business
implementations

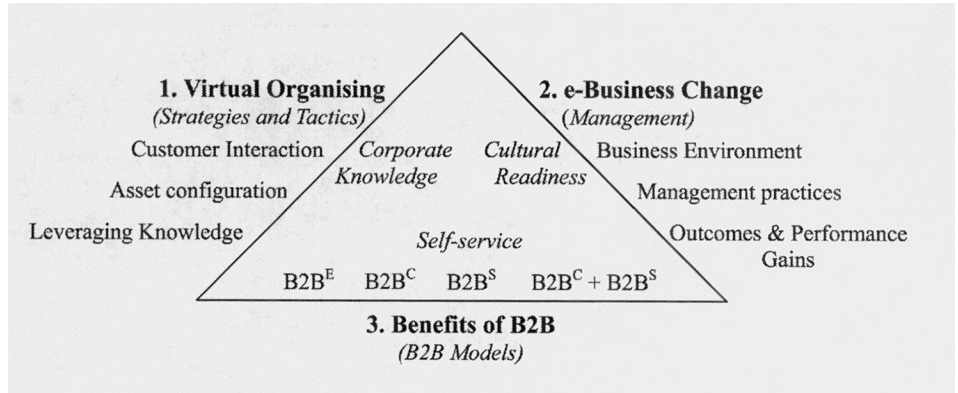


Figure 1 shows the top-level components of the three research models used in the study. Each model reflects a different strategic focus: organisational strategy, change management, strategies and e-business strategies. The final conceptual framework is described in terms of a dynamic model for e-business innovation. The approach is a strategic collaborative process between alliances where there is a continual review of alignment of the e-business transformation (eBT) against business objectives. This is quite distinct from the “one size fits all” approach of centralised planning and allows strategy to evolve with changing market conditions. This approach provides the means to explicitly define and manage relationships between supply network partners and to monitor trends and trigger a revisiting of strategic decisions across the network (Oliver *et al.*, 2003).

Methodology

The study was carried out over a four year period and followed a structured case study approach. This involved multiple interviews in 11 international organisations which were developing extended e-business applications based around their e-ERP systems as shown in Table I. The research questions in association with the three models identified from the literature on the topic were used to develop a composite case-based method. These questions set the main research objectives to test three practitioner “theories-in-use” namely, benefits of e-business implementations derived from virtual organising through eBC management.

The research questions are presented in order of increasing theoretical complexity as:

- RQ1. How do organisations maximise benefits from e-business implementations?
- RQ2. What factors facilitate and inhibit success of e-business implementations?
- RQ3. Do effective strategies for e-business implementations fit the virtual organising model?

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

Primary data – from semi-structured interviews conducted November 1999, June 2000, and June 2001. Three separate interviewees were identified within each organisation and revisited across the study.

Secondary data – from company documents collected or sent via e-mails.

Tertiary data – from case research papers written by third party specialists.

A dynamic model
of e-business
strategies

Case organisation	Industry	B2E interaction	e-business project title	Number of users
<i>Halliburton</i>	Engineering	Intranet access to	“Employee tracking intranet”	~ 11,00 staffs
<i>UBS</i>	Banking	ERP	“Employee Networking”	~ 40,000 employees
<i>Wine society</i>	Retailing	<i>B2C Interaction</i> Internet access to ERP	Online ordering by members	~ 60 staffs
<i>UNICEF Australia</i>	National charity	Internet access to ERP by ASP	First Australian charity web site (B2B ^S and B2B ^C)	~ 35 employees + 30 volunteers
<i>Biotech</i>	Biotechnology	<i>B2B Interaction</i> ERP to supplier catalogues and intranet access to ERP data	Staff research procurement	~ 240 staffs
<i>Novartis</i>	Chemical		Sales order and rapid delivery	~ 22,000
<i>Bertelsmann</i>	Media		Simple ordering e-catalogue	~ 28,000
<i>Statoil</i>	Oil and Gas		Staff travel procurement	~ 18,000
<i>Employee-Nat</i>	Employment		Simple ordering e-catalogue	~ 14,000
<i>FSC – Fujitsu Siemens computer</i>	Computer	ERP to corporate customers	Order request system extended to an e-Mall of three companies	~ 11,000
<i>Dell corp with LSI logic corp</i>	Computer ----- Electronics	non-ERP with ERP	Customised online sales integrated with customers MRO procurement	~ 27,000 ~ 14,000

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Table I.
Participating organisations

Semi-structured interviews were used to collect the primary research data about the 11 case organisations, and analysed at three levels specified in Table II. It should be noted that no formal coding techniques were used but “pattern matching” applied as a data analysis technique. Consistent with a hypothetico-deductive logic approach, the researchers searched for patterns in the empirical research which were consistent with the patterns suggested by the three theoretical propositions underpinned by the three research models.

Three phases of the research method

Figure 2 shows the three types of case-based research methods: exploratory, descriptive, and explanatory. Importantly, it shows the interrelationships between them:

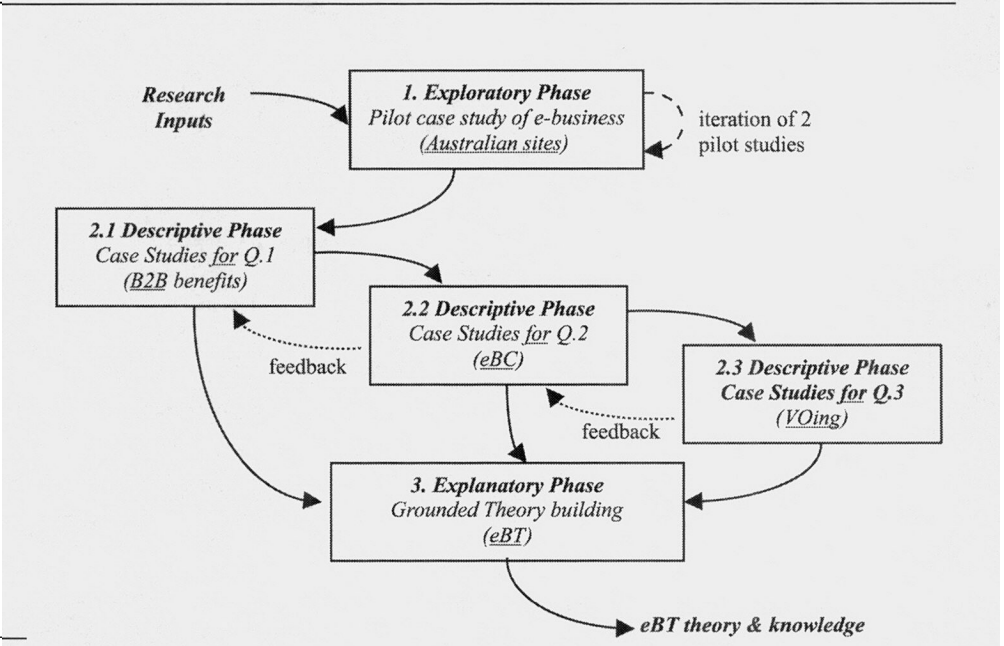
- (1) Exploratory phase 1 – pilot study. Structured-case studies are used in the pilot study to build initial conceptual foundations, with the focus on rigour

Table II.
Analysis techniques

Level	Coding technique ^a	Data analysis
Top level themes	Open	Cross-case content analysis to determine the highest level themes that are critical/essential to e-business planning using all cases
Next level detail of content within key themes	Selective	Cross-case content analysis of selected themes to determine the components that contributes to superior strategic advantage, using exemplar cases
Lower levels of detailed measures	Open and selective	Cross-case content analysis of the components to determine the outcomes, performance gains and measures that contribute to success or failure; using exemplar cases

Note: ^aCoding techniques open and selective are from Strauss and Corbin (1990, pp. 117-18)

Figure 2.
Composite case-based
research method



and relevance. The elements of the structured-case studies method are embedded within a research cycle with multiple inputs for two iterations (Carroll and Swatman, 2000).

- (2) Descriptive phase 2 – main study uses three views of multiple case studies. Eisenhardt (1989) identifies eight research activities as the basics of case work for theory testing of the three research models (Figure 1), using multiple case studies.

(3) Explanatory phase 3 – holistic study. Klein and Myers (1999) offer the key principles for interpretive field research in the “Hermeneutic circle” as the interdependent meaning of the parts to understand the whole they form. In practice, Strauss and Corbin (1990) provide grounded analysis techniques for creating new theory.

This triangulation of methods was applied across three views of e-business. A pilot case study of nine Australian organisations helped ground the theory of the study. This was followed by a three-stage study of 11 international cases within a diverse industry context. Finally, synthesis of the findings of three research models of the main phase of this longitudinal multi-case study was carried out between September 1999 and June 2002. A final conceptual framework was developed in terms of eBT. The concept of eBT is defined as realising the benefits from virtual organising within complex B2B interactions by utilising the facilitators of successful eBC. The case material collected was used to verify all the strategic characteristics of eBT and to develop the dynamic planning model.

E-business transformation model

Figure 3 shows the interrelatedness of the three stages of the transformation model.

The model shows the focus for strategic transformation shifting through three stages of development with outcomes and performance gains realised through greater progression towards e-business innovation:

- (1) Integration of technologies is critical for cost reductions and operating efficiencies along the supply chain (Coltman *et al.*, 2001).
- (2) Differentiation of products and services is critical for e-business market positioning through effective resourcing across multiple supply chains (Oliver *et al.*, 2003; Chang *et al.*, 2003).
- (3) Demonstration of value propositions within an inter-organisational network to design and leverage multiple interdependent communities to create superior economic value across the virtual supply chain (Venkatraman and Henderson, 1998; Riggins, 1999).

Figure 4 shows a map of the issues distilled from the findings of this longitudinal three-stage study. The results of the analysis can be mapped along the e-business stages of growth as: integration of e-business technologies for e-mails and B2B commerce, differentiation of products and services for e-business positioning, and the realisation of value propositions of the e-partnerships. In Figure 4, the three shaded cells in the eBT model (3 × 3) indicate the “critical” elements that require a cultural shift for a real organisational transformation and so represent distinct shifts in the federated planning approach. The other elements contribute to the organisation’s competitive advantage.

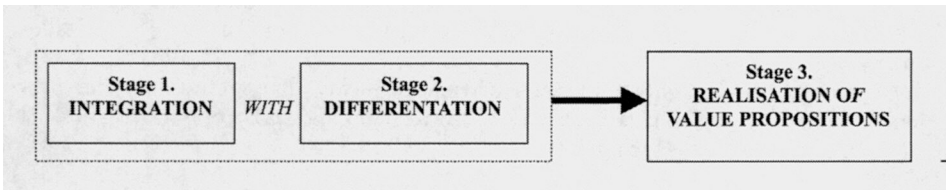


Figure 3. Three stages of transformation model

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

* The diagonal cells(shaded) represent the critical stages of eBT and the arrows represent real organisational transformation with e-business

Figure 4.
Stages of e-business transformation

Case analysis for e-business transformation model

Stage 1: Integration

Technologies: e-ERP. The findings show that "back-end" to "front-end" enterprise application integration is essential to achieve savings and cost reduction. Integration of the system architecture is made possible through a variety of "back-end", "sell-side" and "buy-side" systems; all 11 cases demonstrated this and the planning focus was directed towards internal efficiencies driven top-down. This represents the first "cultural" shift where integration across different functions and processes promotes a mono-culture within the organisation.

Products and services: e-malls. A number of cases developed their e-business systems to create integrated online sales systems offering a variety of products and services for example; Fujitsu Siemens Computers achieved integration of three groups' online sales systems. Again the focus was on efficiency and integration.

Business models: e-commerce B2B integration. The integration of e-business models, B2B^C with B2B^S is essential to maximise efficiency gains from supporting technology infrastructure, so that people can get the job done efficiently. This extends the efficiency focus across the organisational supply chain and a typical example of this was Dell.

Stage 2: Differentiation

Technologies: differential outsourcing. The cases demonstrated a range of outsourcing options from total outsourcing (UNICEF) to partial (Fujitsu). This is the result of the organisation attempting to differentiate itself in the marketplace by focusing only on core business. While this shifts the strategic focus to an external supplier and may create additional strategic issues, it does not generally lead to extensive organisational culture change. It may well, however, create the need for extensive relationship management and failure to do this well as with UNICEF can result in a significant gap between strategic expectations and fulfilment (Levina and Ross, 2003).

Products and services: e-branding. It is at this stage that significant cultural change is experienced when organisations differentiate between brand identity and brand integrity, where "e-branding" becomes a critical issue (Venkatraman and Henderson, 1998). This requires all members of the organisation to look "outside the box" and differentiate between corporate customers and end consumers. Bertlesmann, UNICEF, Wine Society, Dell and Fujitsu all experienced this shift as employees became empowered in their roles and participated meaningfully in the strategic process.

Business models: e-positioning. At this stage the organisation repositions itself in the marketplace through e-services to the wider community. Biotech, Fujitsu, Dell and were all examples of successful differentiators through e-business. The tendency of these pioneers was to start with development of public relationship building and then shift to private relationship building between suppliers and buyers. This occurred very much at grass roots level throughout the organisation with all members embracing a "community culture".

Stage 3: Demonstration of value propositions

Technologies: innovative technologies. The cases gave mixed evidence about the need to embrace advanced technologies but where this occurred it typically added value to the user communities. Halliburton's HR intranet ERP system demonstrated a B2E value proposition. Their technology innovation was bottom-up driven and from both sides of B2E and B2G of the value chain. This bottom-up approach then provided a model for collaborative implementation of the system across the company's global e-ERP infrastructure.

Products and services: e-communities. A number of cases were actively exploiting e-communities through a collaborative planning approach. Statoil and UBS used intranet employee self-service applications to develop a practice of industry-based e-communities. Dell has competence centres where customers can validate system design and configuration without disrupting their live computing network. The focus is very much on extending communities and bringing partners into the planning process.

Business models: e-enterprise model. The final stage of the model is where federated planning applies and when the organisation undergoes a further cultural shift to manage multiple relationships across a global network. A pilot approach demonstrating a value proposition is shown in the One2One relationship formed by Dell and LSI. In the short term, it may be better to adopt e-commerce implementations (e-sales and e-procurement) with new customers and suppliers. This has the capability of persuading existing customers and suppliers that are more resistant to eBC of the win-win value propositions.

Dynamic planning model

The changing strategic focus across the stages of the dynamic planning model are classified in Table III, and viewed as interdependent and supportive of each other. This is especially so in the area of *outcomes* and *performances objectives* where *efficiency* through employee self-service and *effectiveness* through empowerment in customer care is used to support *value adding* activities for sustained competitive advantage. Value includes complementary benefits realised for all network partners across the virtual supply chain. The interplay between strategy, e-business, change management and evaluation is crucial to the creation of dynamic capabilities and will enable organisations to gain sustainable competitive advantage (Zahra and Gerard, 2002).

At stage one of the extended enterprise, the focus is very much internal with top-down planning and an emphasis on training employees to become proficient in self-service to improve operating efficiencies and increase returns on investment. The first shift comes when the enterprise extends its relationships across the full supply chain for products or services. At this stage, the focus is on empowerment and self-learning through bottom up planning within the organisation. There is also a realignment of business objectives to include external alliances across the supply chain. Finally, the focus will be directed towards re-engineering the supply chain through collaborative planning to gain value enhancement throughout the networked community. This occurs with a shift of business model towards the e-enterprise.

The complete model for e-business planning (Table III) can act as a comprehensive tool, for assisting managers in diagnosing the key facilitators and inhibitors of successful stages of e-business development. It is not seen as a prognostic tool. The case analyses confirmed that the more successful projects were found to have facilitators in all components of the eBT framework.

Table III.
Stages of dynamic
planning model

	Stage 1	Stage 2	Stage 3
Strategic focus	Self-service	Empowerment	Relationship building
Planning focus	Top-down	Bottom-up	Federated planning
	Training	Self-learning	Value enhancement
	Internal	External	Collaboration chains
	Organisation	Value chain community	Global networks
Outcomes and performance gains	Improved operating efficiency (ROI)	Effective resourcing and upskilling (QWL)	Virtual and economic value added (EVA)
Note: Return on investment (ROI), Quality of working life (QWL), Economic value added (EVA)			

Managerial implications for successful e-business transformation

Barua *et al.* (2001) specifically refer to the success of a company's e-business initiatives coming from the readiness of customers and suppliers to engage in electronic interactions. To overcome resistance to change, each component must be aligned, along with the enabling technology, to the strategic initiatives (Spathis and Constantinides, 2003). Some key enablers found through this study are highlighted below:

- Organisations attempting to change performance radically seem to require some "sense of urgency" in their business situation, which translates in turn into a compelling vision that is espoused throughout the organisation.
- An important ingredient in the right cultural mix for successful eBT is leadership from the top and initiatives from employees, together with an atmosphere of open communication, participation and committed cross-functional interactions (Yu, 2005).
- An organisation's "vision" for change must be embraced throughout all levels of the organisation, especially by those functional and middle-level managers affected by the eBT. To achieve this requires continuous articulation and communication of the value of reporting results and how each individual is contributing and accountable to the overall company's change effort. At this individual level, concern should be placed on how the e-business system will improve employee satisfaction and the quality of work life.
- Measurement is a means to success. A well-defined transparent management approach should include a documented methodology of change, use objective and quantified metrics showing the value of change, continuously communicate process metrics to senior management, and possess a well-documented rollout of the new e-business design.

Vering and Matthias (2002, p. 159) argue that in the "learning organisation" there is:

- a new generation of system users;
- a constant or continuous nature of change; and
- a demand for both top-down and bottom-up change.

However, change still requires that resources be matched to the business objectives and tasks and, further, that planning systems are appropriate to drive organisational change through workplace implementation (Van Hooft and Stegwee, 2001; Coltman *et al.*, 2001; Huang *et al.*, 2004; Zhao, 2004). Managers should also be prepared to enforce new organisational structures and consider alternative control mechanisms (Kalling, 2003; McAdam and Galloway, 2005). In the new business environment organisational business models are more complex, supply chain networks more flexible and agile, training is shifting to self-directed learning, and collaborative planning approaches are needed to achieve greater added value to the community network (Fahey *et al.*, 2001; Trimi *et al.*, 2005).

Conclusions

This study of e-business planning approaches was based around a triangulation of three independent research models: strategies for virtual organising, eBC strategies and strategic benefits from B2B interaction. Each model exhibits attributes that have

varying influences at different stages of e-business planning and implementation. The current findings are based on 11 case organisations which were investigated over a three year period, through semi-structured interviews.

The results from this study are drawn together into a staged model of eBT and governance and a dynamic strategic planning model for progress through a cycle of innovation. The strategic planning model offers a foundational perspective of strategies, planning tactics and performance objectives for e-business implementations. This can be viewed as a comprehensive approach to governance in which improvement is measured along the three dimensions of integration, differentiation and value enhancement. Successful transition across each dimension will require an organisation to move through three "cultural shifts" towards the development of networks of innovation.

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