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MANAGING THE CHALLENGE OF E-BUSINESS CONVERGENCE THROUGH E-ERP SYSTEMS

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Abstract

This paper examines how to successfully manage e-Business projects with ongoing ERP implementations. The focus is on environmental, management and organisational performance issues. The challenge is to determine facilitators that lead to e-ERP project success from the change efforts. Several case studies with varying dimensions of e-business scope are described in the context of this model. The findings show that successful projects have facilitators in all components of the model, whereas the least successful projects lack facilitators in the area of cultural readiness and change management.

Introduction

Little information is available on how to successfully manage e-Business projects with ongoing ERP implementations (e-ERP) or already productive ERP systems (Hesterbrink, 1999; Holland and Light, 1999). As more and more established organisations realise that they need to form alliances with their customers, partners and suppliers over the Internet, e-business integration with ERP systems becomes a critical global issue (Gable, 1998; Markus and Tanis, 2000).

This paper examines a model (Guha et al, 1997), that proposes various antecedents to e-business change (eBC) management success and relates this to the context of e-ERP environments. The focus is on environmental, management and organisational performance issues. The challenge is to determine facilitators that lead to e-ERP project success from the change efforts. Simultaneously, we seek to identify any major inhibitors to successful e-ERP implementation success.

Several case studies with varying dimensions of e-business scope are described in the context of this model. The initial findings rate all components within the three sub-sections of the research model: *business environment*, *management practice*, and the *outcomes and performance gains*. These ratings suggest that a successful project should have facilitators in all components of the framework, including the business environment, and management practice. Also, the least successful project would lack facilitators in the area of cultural readiness and change management.
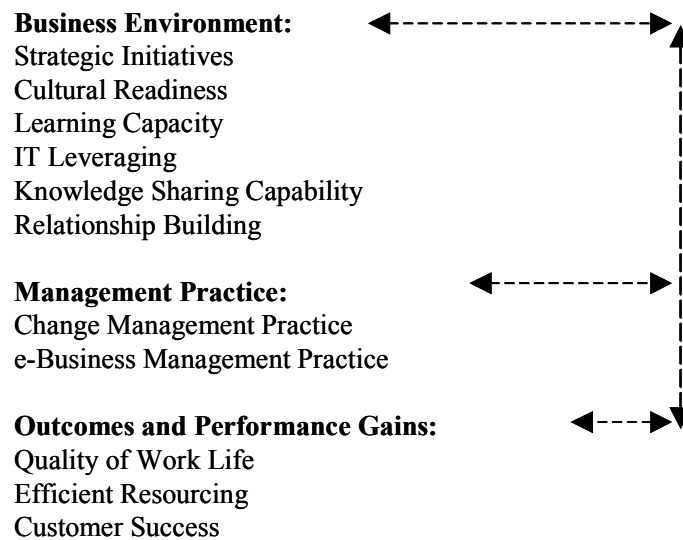
Four cases are singled out for detailed analysis of each construct to confirm the initial findings. Finally, a summation of the findings from the four case studies is captured into patterns of generalisations for each construct. Various patterns are developed as *indicators* of success that have implications for both research and practice. This suggests an improved model of eBC management, refined in terms of the relationships between the elements of the model. Such a model would represent a comprehensive tool, for assisting managers in diagnosing the key facilitators and inhibitors of successful e-business projects for global B2B interaction.

e-Business Change Management

Kalakota et al. (1999, p. 60) state "the creation and implementation of an e-business project is inextricably linked to the management of change." This requires systematic attention to learning processes, organisational culture, technology infrastructure, people and systems thinking. e-Business change (eBC) is defined here as an organisational initiative to design an e-business project "to achieve significant (breakthrough) improvements in performance. For example; cost, quality, responsiveness,

flexibility, satisfaction, shareholder value, and other critical e-business measures" (Guha et al. 1997, p. 121). These performance gains can be achieved through changes in relationships between management, information, technology, organisational structure, and people. Hesterbrink (1999) further emphasises the importance of alignment of those dimensions with respect to ERP and e-Business implementations.

Planning and managing such systems requires an integrated multi-dimensional approach across the e-business and the development of new business process models (Kumar and Crook, 1999; Scheer and Habermann, 2000). Therefore, in any examination of outcomes, consideration should be given to (a) the environmental conditions for change and (b) the ability of the organisation to manage change in those conditions. The model in Figure 1 guides this study in identifying the components that may facilitate and/or inhibit success of e-business change. The components presented in the eBC management framework are based on relevant work in "organisational change, strategic management innovation, and information systems" (Guha et al, 1997: 3).

Business Environment:
Strategic Initiatives
Cultural Readiness
Learning Capacity
IT Leveraging
Knowledge Sharing Capability
Relationship Building

Management Practice:
Change Management Practice
e-Business Management Practice

Outcomes and Performance Gains:
Quality of Work Life
Efficient Resourcing
Customer Success

Figure 1. A Theoretical Framework of e-Business Change Management
(Adapted from Guha et al. 1997)

Methodology

The study used an established theoretical framework from "business process change" research (Guha, 1997), for identifying and examining the facilitators and inhibitors of successful e-business projects within SAP-based organisations. The model identifies three areas to be examined: the change environment, the management of business process change and the outcomes and performance gains. Within each of these there are a number of components and within each component salient dimensions are identified as constructs. During application of this model in a case study, each construct is probed so that the organisation can be classified into one of several categories. For example, one of the constructs for the 'strategic initiatives' component is stimuli, and the resulting probe classifies an organisation into one of two categories: proactive versus reactive.

'Embedded' multiple case-study analysis was chosen to investigate the research questions concerning the complex phenomenon of e-business change projects. Embedded approaches enlist the use of multiple units of analysis; (1) the company (strategy), (2) the project team, (3) the project (Yin, 1989, Eisehardt, 1989). This triangulation attempts to validate primary data. The case-studies selection criterion required a major e-business project, which had organisational implications. Also, as the focus was on studying antecedents to organisational performance, a set of projects having a range of B2B initiatives with variance across cases, but with the same outcome measures was required; cost reductions, responsiveness, flexibility, satisfaction, shareholder value, and other e-business metrics. This enabled 'theoretical' replication with contradictory results in order to examine any differences that might exist in antecedents (Yin, 1989). The *e-Business project* selection criteria used is summarised in Table 2.

Table 1. Research Questions Matrix

Question	Data Collection Instrument	Data Analysis
What are the critical success factors of e-ERP projects?	Structured interview questionnaires; used June-July 2000	Match case content to each component and within each level of the eBC model.
a. Which elements of the eBC model facilitate and/or inhibit e-ERP success?	2nd Interview instrument - structured Questionnaire constructs of components for e-ERP project success	**a.** Content analysis of components summary data. **b.** Content analysis of constructs to determine the factors that contribute to success or failure.
b. Is the eBC model appropriate for diagnosing e-ERP success?	Semi-structured interviews questionnaires; June 2000	Revise the eBC model using the findings of the e-ERP success.

Table 2. Cases (8) versus Project Selection Criteria

Criterion of Project	Society	Charity	Employ	Bank	Engineer	Biotec	Comptec	PCsell
i. Major e-business project	B2C	B2C	$B2B^E$	$B2B^E$	$B2B^E$	$B2B^S$	$B2B^C$	$B2B^S$ + $B2B^C$
ii. Project completed	✓	Staged	✓	✓	✓	✓	✓	✓
iii. Expected breakthrough	✓	✓	✓	✓	✓	✓	✓	✓
iv. Inter-organisation focus*	**nil**	**nil**	**nil**	**nil**	**nil**	**low**	**moderate**	**high**
v. Unambiguous outcomes		✓	✓	✓	✓	✓	✓	✓
No. of Employees	50	35+	11000	45000	1200	240	11000	27000
Project Focus	Admin	Admin by ASP	National network	Staff network	Personnel mgt	B2B Buying	B2B Sell-side	B2B Buy+sell

* Ascending order of B2B interaction   ⟶

Data-collection methods included a semi-structured case protocol; a qualitative interview questionnaire, multiple documents and archival records, and telephone interviews. Literature regarding eBC projects, including data on company performance, was studied prior to and after each set of interviews. This approach provided richness and depth and enhanced the construct validity of the study.

Initial Findings

All eight cases were used for an initial assessment of the components of the eBC management model. These were then compared with each other as shown in Table 3.

Overall the findings in Table 3 show *PCsell* achieved most success, *Engineer* achieved moderate success, and *Society* was least successful. Again, the cases in Table 3 are exhibited in ascending order of B2B interaction. If we assume these ratings captured in Table 3 reflect the presence of facilitators and inhibitors, then the initial findings indicate that a successful project should have facilitators in all components, including the business environment and project management; eg *Pcsell.com*. Further there is the implication that; the least successful e-business projects will have inhibitors in both dimensions, especially in the area of cultural readiness and change management practice; eg *Society.com*.

Table 3. Ratings of the Components of eBC Management

Components of eBC Management	Society	Charity	Employ	Bank	Engineer	Biotec	Comptec	PCsell & Customer
Environment								
Strategic Initiatives	High	High	High	High	Moderate	High	Moderate	High
Cultural Readiness	Low	Moderate	Low	Moderate	Moderate	High	Low	High
IT Leveragability	High	High	High	High	High	High	High	High
Knowledge Capability	Moderate	Moderate	Moderate	High	High	High	Moderate	High
Relationship building	Moderate	Moderate	Moderate	Moderate	Moderate	High	Moderate	High
Learning Capacity	Moderate	Low	Moderate	Moderate	Moderate	High	Low	High
Management								
Change Mgt Practice	Low	Low	Moderate	Moderate	Moderate	High	Moderate	High
e-Business Mgt Practice	Low	Moderate	Low	High	High	High	Moderate	High
Performance Gains								
Quality of working life	Low	Moderate	Low	High	High	Moderate	Low	High
Business resourcing	(future)	(future)	Moderate	(future)	(future)	High	(future)	High
Customer interaction	Low	Moderate	(future)	(future)	(future)	(future)	High	High
gaps between expected & actual performance	small	small	small	small	small	small	some	small
e-ERP Success	Very low	Moderate	Low	Moderate	Moderate	High	Moderate	Very high
* B2B Interaction	nil	nil	nil	nil	**nil**	**Low**	**Moderate**	**High**

* Ascending order of B2B interaction ———————————————→

	Ratings:	Low	Moderate	High

Case Results

The four cases discussed below, provide the content for analysis against the eBC model.

Case 1 A large global engineering company with its headquarters in USA. *Engineer.com* is a global leader in energy equipment, energy services, engineering, and construction. It had three main goals to achieve with its initial SAP R/3 implementation; (i) to standardize business processes globally across business units and functional lines, (ii) to migrate *Engineer.com* into a process-driven organization, (iii) and to provide managers of *Engineer.com* easy access to decision-quality information. It has about 17,000 SAP users worldwide, with the potential for this figure to increase to about 26,000 users (SAP, 1999c). The specific country group examined was based in Norway.

Engineer's – "Personnel Tracking and Reporting" Intranet

This in-house Web initiative that allows access to R/3 personnel data. It is an incremental HR Intranet to support project management of offshore skilled agency workers. Its application has proven to be a major tool for supporting decision making for minimising labour costs. It has been expanded to include a computer hardware tracking system. With the aid of computer graphics this Intranet systems provides a simple "walk-up" user interface for casual users, including project managers who have little or no training for using the R/3 HR module.

e-Business Benefits

The primary beneficiaries were the offshore project managers, who needed access to the HR employee tables for personnel management and gained this through the innovative use of web-based technology. The result was one of considerable costs saving and greatly improved staff resourcing through improved decision making by the project managers when working off shore. The intrinsic motivation and self-management of autonomous knowledge within the development team played an important role in the successful implementation. The emphasis was much more on collective performance rather than individual but at the same time development and maintenance of personal and professional reputations was a significant driver. Interestingly, while the project was rated highly successful there was strong opposition from their partner operations to implement the same system and this came from the counterpart HR staff who had not been exposed to the participative development process. The organisational management was luke-warm in their support initially, viewing the proposed system as a threat to a strongly centralised control culture. Once the results broke down their initial resistance, management "assumed" responsibility for the success and leadership for global implementation. *"We are very proud of our Web-based Personnel Reporting system."*

Case 2

Biotec.com is a research and development stage pharmaceutical company based in UK. Its mission is to create partnerships with pharmaceuticals companies to complete the development and marketing of its compounds. Founded in 1986, *Biotec* currently employs approximately 250 staff.

Biotec's – "B2B e-Procurement" Project

The primary objective of the "SAP B2B Procurement" project was to ease the workload of the company 's procurement department by automating the old, paper-bound purchasing process. With some 3,000 active vendors on their books, the procurement department 's four members were often left floundering hopelessly in a sea of paper. "We were determined to cut this high number of vendors. The next step of the project is to negotiate more favourable conditions with our slimmed-down vendor base and build up closer business relationships."

E-Business Benefits

Biotec is a research and development stage pharmaceutical company based in UK. Its mission is to create partnerships with pharmaceuticals companies to complete the development and marketing of its compounds. The SAP B2B Procurement project was able to ease the workload of the company 's procurement department by automating the old, paper-bound purchasing process. The next step of the project was to negotiate more favourable conditions with our slimmed-down vendor base and build up closer business relationships with each one." Apart from more efficient purchasing procedures, the company 's buyers have a more interesting job. Biotecs scientists should be relieved of routine paperwork, enabling them to concentrate more on research. "SAP B2B Procurement will broaden these people 's day-to-day task base considerably. *"They 'll have more time to spend on nurturing relationships and working on optimisation of projects and other duties."*

Case 3

Comptec.com is a global leader in IT equipment, has its headquarters in Amsterdam, Netherlands. With extensive European manufacturing facilities, customer-focused companies in 25 European countries and more than 9,000 experienced employees. Compect.com is aiming to be the "No. 1" computer company in its home market in Europe, by the year 2001. *Comptec* provides the industry's most complete portfolio of best-in-class IT products, from the smallest notebooks to the most powerful data centre solutions. Developed and manufactured in Europe for European customers, the product portfolio benefits from the technologies and worldwide sourcing networks of the parent companies (Comptec, 1999). The specific country group examined was based in England.

Comptec's "Order and Request System" Online Sales R/3-Based Solution

Comptec e-business to realise its global sale revenue potential. For *Comptec*, the Order and Request System (ORS) was developed in-house, to optimise processes between *Comptec* and partner organisations (Comptec, 1999). The Order and Request System (ORS) was introduced in 1997 as an electronic commerce system in the business-to-business sector. It builds on the SAP strategy to link the R/3 system and the Internet and supports the logistics processes of the parent company across divisions and regions. Each registered partner is able to place orders online at any time via the Internet, track those orders, and request current information on orders and delivery dates.

e-Business Benefits

This case study shows how computer technology division within a large global organisation succeeded in making the sell-side business processes of their ERP systems available over the Internet. An "Order and Request (extranet) System" was developed as an appropriate online sales system by leveraging the power of graphics and Internet technology extended the reach of the R/3 logistic module, for cross-divisional users. The efficiency gains came from speed, accuracy and security of order transactions. The primary beneficiaries were the other business partners (divisions) and independent partners. The result was one of considerable cost saving and greatly improved online sales, through any time anywhere access.

Interestingly, while the project was rated moderately successful due to luke warm support and the early interest by business partners. The opposition came from the partner reluctance to implement the same system came from the conflict of the established offline sales channels. Further, the lack of a coordinated corporate wide strategy by the parent company was viewed as the main obstacle for uptake of the system by the business partners.

The lessons learnt were two fold; (i) the use of a common platform (SAP-based) needs the agreement of all functionality, (ii) The internal and external marketing of the facility is essential acceptance of divisional business network and to foster end-user acceptance of the technological change in business practice. Once the results broke down their initial resistance, management "assumed" responsibility for the success and leadership for global implementation.

> *"We are beginning to recognise the potential benefits of leveraging our SAP R/3 business processes and functionality through the new Web-based environment."*

In this case study acceptance of the project management initiatives requires a comprehensive global deployment. It highlights the need to evolve a coordinated corporate strategy and encourage the balancing of conflicting organisational knowledge, when contemplating the adoption of e-business solutions.

Cases 4a and 4b

PCsell, is a leading PC and Server provider based in USA. Using *PCsell's* intelligent Web site, corporate customers and end-consumers can validate system design and system configurations, before making their online PC purchases. One of *PCsell*'s largest corporate customers is *Customer.com*. *Customer.com* is an established USA based manufacturer of electronic components and circuits.

B2B e-Commerce Integration

In June 2000, *PCsell* implemented its first "B2B e-Commerce Integration" system with *Customer.com*. The system fully integrates *Customer's* "B2B Procurment" system with *PCsell's* "Online Sales" system. This enabled *Customer* to leverage its existing SAP backend system with *PCsell*'s component-based e-business system. Both companies are expecting to extend the use of this inter-organisational development with other partners. Finally, the project represents a foundational infrastructure for private e-Markets.

e-Business Benefits

In 2000 PCSell pioneered its first B2B "e-Business Integration" with an established customer company. This case demonstrates a comprehensive approach to inter-enterprise computing. This is example of an integration architecture is made possible through a variety of backend systems and procurement systems.

One of their customers, *Customer.com*, leveraged its existing SAP backend system and SAP business Connector (powered webMethods technology) to communicate directly with Dell's e-business system. The integration between *Customer.com's* SAP ERP and SAP B2B procurement application to its customer Dell catalogue automated the procurement of Dell products via the Internet (Dell, 2000).

> *"We are beginning to recognise the potential benefits of leveraging our partners SAP R/3 business processes and functionality through the e-Commerce integration."*

The Overall Results

Table 4 offers, under each of the eBC framework's major concepts, a synopsis of significant constructs and the context in which they were viewed as either facilitators or inhibitors of each case's outcome. While the granularity of this analysis does not allow us to "predict" success, based on a simple summation of facilitators and inhibitors in each case, the results seem to indicate that successful projects have more facilitators. Some may have a more local impact on a certain aspect or phase of eBC. However, we believe that the inference that a highly successful eBC effort should demonstrate numerous positive facilitators and minimize inhibitors is reasonable. As indicated in Table 2, *PCsell* was classified as the most successful project consistently showing positive facilitators in all components of the eBC model. At the other extreme, *Comptec*, which had many more inhibitors, was the least successful project. Inhibitors show the greatest clustering in the areas of cultural readiness and change management.

Table 4. Generalised Findings for Each Construct

Components Constructs	Most Successful	Least Successful
Strategic Initiatives		
stimuli	pro-active	reactive
formulation scope	incremental	revolutionary
decision making	champion emergence	autocratic
strategy led	onset	none
Cultural Readiness		
change agents & leadership	+	-
risk aversion	welcomed	cautious
extent of open communication	+	+
Learning Capacity		
adaptation	learning from others	response to IT change
improve efficiency	learning by doing	learning by doing
learning type	double-loop	single-loop
external information use	boundary spanners	technology gate keeper
declarative knowledge	focus on core competencies	R&D resources IT development
IT Leveragability		
use of Internet technology	+ superior	- poor
role of IT	enabling & socio-technical	dominant factor
Network Relationships		
inter-organisational linkages	cooperative	non-cooperative/ competitive
cross-functional cooperation	superior	poor
Change Mgt Practice		
mgt's. readiness to change	committed	resistant
pattern of change	+	-
scope of change	improvement	radical change
managed change	well managed process for change	alleviation of dissatisfaction,
e-Business Mgt Practice		
e-business measurement	use e-bus metrics	improvement feedback loop
use of tools and techniques	adequate / superior	poor
team-based structure	+	-

Key: + = facilitator,   - = inhibitor

Summary

An established research framework of e-Business change is used to identify the factors for success of an e-business project within an ERP environment. The qualitative data provided content and discovery of elements that surround each construct to identify those facilitating and inhibiting factors that lead to ultimate eBC goals. The results confirm that a successful project was found to have facilitators in all components of the eBC management framework, including the change environment and management practice. Further there is the implication that; the least successful e-business projects will have inhibitors in both dimensions, especially in the area of cultural readiness and change management.

The cases presented were used to test the suitability of an established research framework for gathering evidence to identify the factors for success of an e-business project. In order to avoid an original IT-centric position, we emphasise the importance of managing the change of e-business projects. This research framework was chosen as a method for its ability to examine complex phenomena. It is seen as evolutionary in nature, and was content driven. It is essentially a diagnostic tool for identifying factors contributing to success of new business models. It is not seen as a prognostic tool. It specifically explores the areas related to the successful learning organisation where the key issues remain as people oriented organisational issues. In the future as e-business activities become common place, corporate portals for empowering employees for doing business online with partners will be considered as a competitive necessity.

While broad generalizations from the four case studies may be viewed as premature, various patterns of constructs were developed as *indicators* that have implications for both research and practice. For e-ERP projects, these patterns represent indicators for; success, failure, a tendency to mediocrity, and variances across B2B interaction, where the latter is regarded as the most significant indicator.

These are complex issues that can never be solved with technology alone. They require leadership, appropriate problem solving skills, lots of hard work and executive commitment and a culture that embraces the ideals of the learning organisation (a team and community oriented work process. The organisational design, learning environment, and human-to-human communication and collaboration must be aligned to the enabling technology. "One should always keep in mind the balance between people, business processes, and technology" (Carlson, 1995). In a labour force of inter-divisional virtual teams management will be more about motivation and governance may be largely a question of self-regulation rather than traditional managerial control.

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