Assessing the benefits from e-business transformation through effective enterprise management

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Abstract

This paper reports on research carried out in 1999–2001 on the use of e-business applications in enterprise resource planning (ERP)-based organisations. Multiple structured interviews were used to collect data on 11 established organisations from a diverse range of industries. The findings are analysed according to the level of sophistication of e-business models and their transformational impact on the organisation. Early adopters of e-business show a trend towards cost reductions and administrative efficiencies from e-procurement and self-service applications used by customers and employees. More mature users focus on strategic advantage and generate this through an evolutionary model of organisational change. Two complex case studies of e-business integration with global suppliers and their corporate customers are analysed to identify specific stages of benefits accrual through the e-business transformation process. Collectively, the set of case studies is used to demonstrate the increased benefits derived from an e-business architecture based on a network of ERP-enabled organisations.
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Introduction

Enterprise resource planning (ERP) technology has been profoundly influenced and transformed by the Internet. Until recently, the ERP paradigm was largely confined within the walls of the traditional business enterprise. The Internet serves to extend the original value proposition of ERP, by breaking down institutional barriers and rendering cross-organisational boundaries almost obsolete (Gonzalez, 1998; Larsen, 2000). Internet technologies offer an ERP-based organisation the opportunity to build interactive relationships with its business partners, by improved efficiencies and extended reach, at a very low cost (Hesterbrink, 1999; Perez *et al.*, 1999). Organisations that fail to seize this opportunity become vulnerable as rivals establish themselves first in the electronic marketplace. They may eventually be forced to participate in Internet commerce by competitors, customers or consumers (Hoffman *et al.*, 1997).

The early adopters of e-business applications typically focused on improved efficiencies, realising the benefits from procurement and self-service applications. For example, Statoil expects savings of 30% from a 2 billion US$ annual purchases bill and British Biotech has reduced the time to fill an order from ten to less than two days. As organisations mature in

their use of e-technologies so benefits arise from applications, which focus on improved services internally and externally such as UBS Banking with an intranet for the internal organisation of 40,000 employees globally and Siemens with an expected 25% improvement in global sales from its e-shopping mall (SAP, 2000). Reports of benefits derived from such implementations provide mixed evidence of success and a lack of empirical data to support higher profitability and productivity claims (Akkermans & van Helden, 2002).

This paper reports on the findings from a longitudinal study of ERP-enabled organisations that pioneered the use of e-business applications. The research was carried out in 1999–2001 through semi-structured interviews. The objective was to identify the benefits and problems encountered by the early adopters of e-business applications with ERP (e-ERP) according to a set of business-to-business (B2B) interaction models. The findings are analysed according to the level of sophistication of B2B interaction. Two case studies of B2B e-business integration with global companies and their corporate customers are used to demonstrate a more complex business interaction model, supported by a network of ERP systems. Collectively, the cases show that added benefits arise from an increased level of sophistication of B2B interaction, but are only fully realised when adequate attention is given to organisational transformation and the management of change.

Within the context of this paper, e-ERP refers to Internet-enabled ERP applications covering the whole spectrum of internal and external integration. Early adopters are those who implemented e-ERP systems before 1999 and levels of maturity relate to the extent to which the e-ERP systems encompass all aspects of business-to-consumer (B2C), business-to-employee (B2E) and B2B applications as defined in the next section of this paper.

E-ERP implementations

An e-business implementation is from the outset aimed at integrating business processes with external business partners and is built on and supported by the ERP foundation. The main focus of the implementation will therefore be the integration of cross-company value chains using e-business tools (Curran & Ladd, 2000; Kalakota & Robinson, 1999). An ERP implementation has a defined lifecycle, typically 12–24 months depending on the scope and other parameters (Blain, 1999). After the initial implementation, upgrade and functional enhancement projects follow in irregular intervals. e-Business implementations need to be significantly faster than initial ERP implementations (Hesterbrink, 1999). However, it can be expected that these activities will continue on an ongoing basis to accommodate changing relationships with business partners and enhanced functional and technical scope of existing relationships (Norris et al., 2000; Osterle et al., 2001).

The importance of combining ERP packages with the Internet has a two-way benefit and return on investment. 'Once Internet technology is efficiently integrated into the internal operation, its effective use for external interactions becomes a natural and easy extension. Without the internal infrastructure, external interactions will always be strained and limited' (Telleen, 1996). The coupling of these technologies is seen as a shift from the traditional emphasis on transaction processing, integrated logistics and workflows to systems that support competencies for communications building, people networks and on-the-job learning (Carlson, 1995; Manville, 1997).

Although these technologies have distinctly different functions, integrated they offer a sound infrastructure for doing e-business (Venkatraman & Henderson, 1998). Here e-business means 'making the key business processes of an organisation available over the Internet' (Boey et al., 1999). In general, it is about electronic interactions between organisations. Although simple, this definition nevertheless incorporates some subtle but key points about e-business applications with ERP systems.

Figure 1 is used to illustrate how these concepts of e-business relate to a set of B2B models that include: business to supplier (B2B^S), B2E and business-to-corporate customer (B2B^C).

B2B^S refers to a sub-set of B2B, where the organisation's employees have Web access to suppliers' internal system; for example, materials catalogue and prices within the procurement agreements.

B2E is viewed as Intranet access for all employees to their organisation's ERP data, from anywhere, anytime (24 × 7). It offers transparent Web-based access to important policy, manuals and procedure documents across
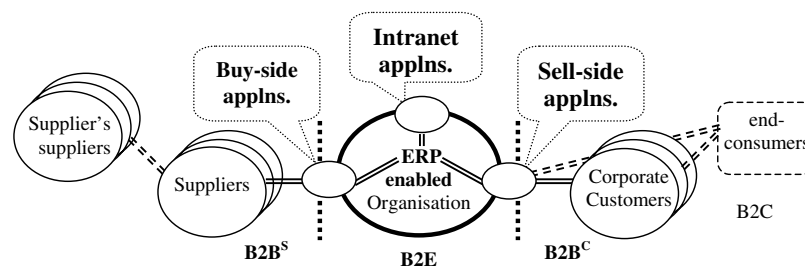

Figure 1 B2B model of a single ERP-enabled organisation.

all departments. An Intranet 'also offers collective use of many functions. For example, employees can create individual homepages, collectively offering important information 'into' the organisation' (Perez *et al.*, 1999, p 51).

B2B^C refers to a sub-set of B2B where corporate customers and distributors have access to the organisations order system. B2B^C is differentiated from B2C where the latter infers 'direct' online selling to end-consumers, who have no internal business systems.

A composite model of B2B–B2B^S, B2E, and B2B^C that extends to Internet access for consumers (B2C), and includes all inter- and intra-business interactions was proposed as the research framework in which benefits are realised. This model was used as a general guide to assess the e-business implementation patterns of ERP-enabled organisations. The use of ERP-enabled organisations allowed us to ensure that our case studies focused on advanced use of Information and Communications Technologies (ICT) to underpin the business and complete front- and back-end integration.

The study took place over a 2-year period and covered 11 organisations worldwide with at least two face-to-face interviews with several interviewees from each organisation supported by document analysis, telephone calls, e-mails and web searches. All cases showed that a staged pattern of change was the preferred transition route to e-business. The early adopters of e-business applications show an initial trend towards realising the benefits from procurement, and self-service applications. Two case studies, of B2B e-business integration with global companies and their customers, are used to demonstrate a more complex business interaction model supported by a network of ERP systems. Collectively, the cases show that added benefits arise from an increased level of sophistication of B2B interaction but may not be realised if sound change management principles and processes are not observed.

Selection of cases

'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; (2) the project team; (3) the project (Eisenhardt, 1989; Yin, 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 homogeneous set of projects (having similar initiatives) with variance across cases on the outcome measures – cost, responsiveness, flexibility, satisfaction, shareholder value and other e-business metrics – was required. This enabled 'theoretical' replication with contradictory results in order to examine any differences that might exist in antecedents (Yin, 1989). In each case, a senior IT project manager was contacted for the purpose of conducting the initial interview. This also identified other managers, team members and users for interview.

The primary questions for the interview are summarised in Table 1. However, it should be noted that the researchers used a semi-structured interview format based on existing models of e-business implementation and change management (Guha *et al.*, 1997; Venkatraman & Henderson, 1998). The first interview explored the levels of sophistication of e-ERP implementation using the framework developed by Venkatraman & Henderson (1998). The second interview explored the specific e-business management issues that impeded or facilitated effective implementation using an e-business change management framework developed by Guha *et al.* (1997). The use of two different models allowed the researchers to obtain a multi-view of the issues from at least three separate users of the systems.

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

- B2E to harness the flow/sharing of corporate information, via intranets.
- B2C to access a 24×7 global consumer base, via the Web.
- Business-to-Business (B2B^S and B2B^C) to support supply chain management between partner organisations.

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

Findings

Findings for B2E cases
The cases profiled in Table 3 demonstrate the use of e-business intranet applications. This category of application

Table 1   Research questions matrix

Question	Data collection instrument	Data analysis
(a) How do organisations maximise the benefits from e-business projects?	Semi-structured 1st interview questionnaire; used Nov–Dec 1999	Match case content of each e-business project against B2B interaction
(b) What is the nature of business models induced by e-business?	Project correspondence with project managers and consultants	Content analysis of qualitative data. Cross-case analysis of benefits to determine the components
(c) Does the increase in B2B interaction deliver increased benefits from e-business?	Public and private company documents; June 1999–June 2001 2nd interview June/	Rate the level of benefits against the increased level of B2B interaction

Table 2   Business-to-business cases

Case alias[a]	B2E interaction	Employees	e-Business project title	No. of users
(1) Engineer.com	Intranet access to ERP	Managers and engineers	Employee Tracking Intranet	~1100 staff
(2) Bank.com		All employees	Employee Networking	~40,000 bank employees
	B2C interaction	Consumers		
(3) Society.com	Internet access to ERP	Members	Online ordering by members	~60 staff
(4) Charity.com	Internet access to ERP by ASP	Citizens & corporate	First charity Web site	~35 employees+ 30 volunteers
	B2B interaction	B2B sub-class		
(5) Biotec.com	ERP to supplier catalogues	B2B[S]	Staff research procurement	~240 researchers
(6) Pharma.com		B2B[S]	Sales order and rapid delivery	~22,000
(7) Media.com		B2E, B2B[S]	Simple ordering e-catalogue	~28,000
(8) O&Gas.com	And some Intranet access to ERPdata	B2E, B2B[S]	Staff travel procurement	~18,000
(9) Employee.gov		B2B[S], B2E	Simple ordering e-catalogue	~14,000
(10) Comptec.com (cross-divisional)	ERP to customers	B2B[C]	Order request system extended to an e-mall of three companies	~11,000
(11) PCsell.com with	Non-ERP to ERP	B2B[C]	Customised online sales	~27,000
Customer.com		with B2B[S]	Integrated with customers MRO procurement	~14,000

[a]*Two large companies with increasing level of employee access 24 × 7 to personnel data.*

Table 3   Business-to-employee (B2E) cases

B2E interaction (level)	Case alias[a]	B2E	e-Business example	No. of users
Intranet access to ERP	(1) Engineer.com	Managers and engineers	Mgt reporting and tracking of skilled contractors	~1100 staff
	(2) Bank.com	All employees	Networking of employees across a very large bank	~40,000 bank employees

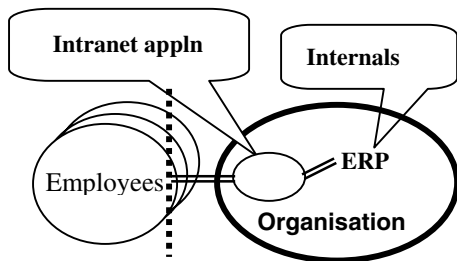[a]See footnote in Table 2.

Figure 2 B2E model of an ERP-enabled organisation for employee self-service.

links a company's ERP data to the Web to provide access for all employees to corporate data 24 × 7. Typically, it represents the earliest stage of e-ERP implementations. Motivation for these developments is cost and efficiency based, offering significant benefits from networking employees. The cases are presented in order of increasing e-ERP sophistication but decreasing information management and reporting.

The B2E model of a single ERP to employee Intranet is illustrated in Figure 2.

B2E employee self-service for improved quality of work life Two large established organisations in different industries implemented organisational intranets that combined with their ERP business processes. These solutions were easy to deploy while offering significant benefits from networking employees and the management of corporate information.

Bank.com implemented the e-ERP solution for internal address management. It covers all organisational information within the bank and is the most-used Web application, available for over 40,000 employees, with 300,000 transaction calls per day. It implemented its own Intranet integrated with ERP to facilitate the networking of the staff in preparation for e-business. 'This is a generic office management solution, not a Banking industry solution, to save time and paper for the distribution of staff information'. It offers transparent access to important policy manuals and procedure documents across all departments. It also offers collective use of multiple functions.

Engineer.com staff developed an in-house Web initiative that allows access to ERP personnel data. It is a specific example of an HR Intranet application to improve

Table 4 Business-to-consumer (B2C) cases

B2C interaction	Case alias[a]	Consumers	e-Business example	No. of users
Internet access to ERP	(3) Society.com	Members	e-Shopfront for wines sales and services to registered members	~60 staff
Internet access to ERP by ASP	(4) Charity.com	Citizens and corporate	First Australian charity Web site for sales of greetings cards, etc.	~35 employees+30 volunteers

[a]Two SMEs with consumer access (24 × 7) to R/3 sales catalogues and order data, decreasing level of ownership.

personnel management in Oil and Gas construction projects. The application has proven to be a major tool for supporting decision making towards minimising offshore labour costs of skilled agency workers in offshore projects. With the aid of computer graphics, this Intranet system provides a simple 'walk-up' user interface for casual users, including project managers who have little or no training on the use of the HR module. It has been expanded to include a computer hardware tracking system. The following critical issues were identified:

To *maximise the benefits:*

- A recognition that the inspiration of employee self-service applications comes from key users.
- The implementation requires a concerted corporate focus.
- A recognition to create the Intranet system as a 'learning system'.
- Managers and IT staff must learn together (fast) to seek new business models.

To *minimise the barriers:*

- The design of Intranet interface has to accommodate least trained employees.
- The design of the Web interface must enable users to be more efficient than other means.

In summary, by allowing employees appropriate access to core systems:

(i)   The managers in the *Engineer.com* case were able to *reduce costs.*
(ii) The employees in the *Bank.com* case were able to benefit from *efficient service.*
(iii) In both cases, the e-business applications offers collective use of many functions or '*shared services*' across certain groups (Perez *et al.*, 1999, p 49).

Finally, in maximising the benefits and minimising the barriers, stimulating *employee self-service* is critical.

Findings from B2C cases

The cases profiled in Table 4 demonstrate the use of an e-business 'sell-side' application. This category of application links a company's ERP catalogues and ordering processes to the Web, for example, SAP's 'Online Store'. It represents a primary stage of an e-business implementa-
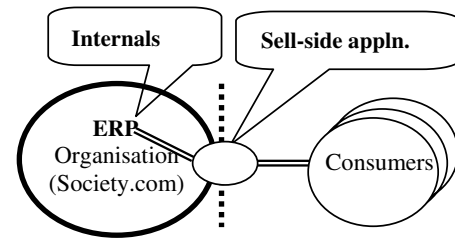

Figure 3 B2C model of a single ERP-enabled organisation for consumers.
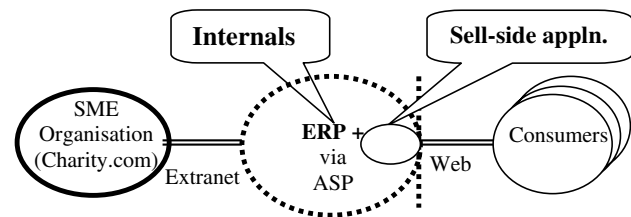

Figure 4 B2C model of an ASP hosting e-business for consumer sales.

tion. The motivation for these developments or business driver is cost reductions and customised products from B2C interaction. The cases are presented in order of increasing e-ERP sophistication.

Two models for B2C interaction of a single ERP-enabled organisation are illustrated by Figures 3 and 4.

B2C online store for improved access to customised products and services Using SAP's suite of e-business applications, *Society.com* was able to move its mail order business in a greater variety of directions without having to re-engineer its business processes; for example, any time, anywhere. From the feedback through the Web site of 20 to 30 e-mails per day, 'we are beginning to understand what our members want', – 'although we have not yet delivered this'. In addition, some technical issues were encountered; for example, the lack of available business application interfaces from SAP.

During 1999–2000, *Charity.org* an Australian division of a global organisation pioneered a B2C 'Online Donations Facility'. This was achieved by outsourcing its total IT support, to an application service provider (ASP). This

infrastructure provided a fully integrated business administrative solution for the organisation's existing Web site, for the online sales of gift cards. It allowed for an improved product range (online), and a new business image. However, major problems still remained such as 'how do we let people know we have a Web presence?' Some technical issues also affect the matching of business processes with ERP. The critical issues identified were:

To *maximise benefits*

- Be more pro-active by making the Web site enjoyable and fun to navigate.
- Utilise synergy between industry networks, e-mail lists and Web links.
- Provide capability on the Web site to improve the product education.
- Improve publicity via e-mails and online catalogues.

To *minimise barriers*

- Tackle all unresolved basic business issues (inefficient and ineffective processes within the e-business system), for example, improve the tracking of orders as well as resolve out-of-stock procedures.
- Take charge of the ethical issues in credit taken from members before the stock is processed.
- Communication between branches is an issue and must be addressed.
- Empower staff in customer care.

In summary, by allowing consumers appropriate access to core systems:

(i) *Charity.com* was able to *reduce costs* in its business administration and the high cost of e-ERP ownership by application hosting from an ASP.
(ii) In both cases, the e-ERP solutions enabled the organisations to benefit from *revenue generation*.
(iii) The customers in the *Charity.com* case were able to benefit from *efficient service*.
(iv) In both cases the e-business applications offers collective use of many functions or '*shared services*' across certain groups (Perez *et al.*, 1999, p 49).

Finally, the two cases represent a new approach towards revenue generation. In maximising the benefits and minimising the barriers, stimulating *customer and employee self-service* is critical.

Findings for B2B: B2B[S] and B2B[C] cases

The cases profiled in Table 5 demonstrate the use of e-business 'buy-side' applications. This category of application links a company's ERP purchasing processes to a supplier's catalogues, for example, SAP 'B2B Procurement'. Typically, it represents a second stage of an e-business implementation. The motivation for these developments or business driver is cost reductions and efficiency gains, and also improved service and product image, from B2Bs interaction. The cases are presented in order of increasing e-business sophistication and integration with B2E.

The B2B[S] model for a single ERP-enabled organisation is illustrated in Figure 5.

B2B[S] e-Procurement for shorter lead times and lower costs

The cases in Table 5 are implementations of desktop procurement system designed for the non-professional procurement staff (Segev & Gebauer, 2001). The focus is on indirect procurement functions that include maintenance, repair, and operating supplies. It highlights the issue of retraining for the change in roles from employee self-service.

With a B2B procurement e-business solution, *Biotec* reported that 'lead times to fill an order were shaved down from 4 to just 1 day – from the point in time when
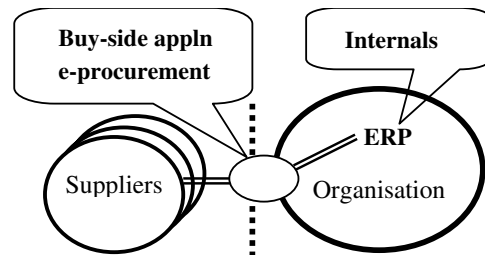

Figure 5   B2B[s] model of e-procurement from suppliers.

Table 5   Business-to-supplier B2B[S]

B2B interaction (level)	Case alias[a]	B2B sub-class	e-Business example	No. of users
ERP to supplier catalogues, with some Intranet access to ERP	(5) Biotec.com	B2B[S]	e-Procurement of bio-chemicals and pharmaceutical items for core business	~240 researchers
	(6) Pharma.com	B2B[S]		~22,000
	(7) O&Gas.com	B2E, B2B[S]	e-Procurement as first stage of B2Bs and e-Marketplace	~18,000
	(8) Media.com	B2B[S], B2E	e-Procurement as first stage of global e-Business	~28,000
	(9) Employee.gov	B2B[S], B2E	e-Procurement + HR timesheets	~14,000

[a]Five cases representing four industries, ordered by increasing level of B2B[S] interaction with B2E.

an employee identifies an order, to actual delivery'. Having achieved shorter lead times, *Biotec* no longer needs to keep large stocks of materials, so expenditures are down and cash flow is healthier. Indeed, the company expects to save between 10 and 15% on the cost of purchasing materials.

Another goal of the B2B project was to build more long-term links with preferred vendors. So far, *Biotec* has identified three such vendors. Their Internet sites were linked into the e-procurement system, allowing Biotech staff to use e-procurement on the company's own intranet and to purchase from both the internal catalogue and external online catalogues. This was made possible by a specially developed open catalogue interface.

The procurement department already attributes one major success to its new procurement process: It has been able to increase the discounts previously offered by its three preferred vendors a further five percent (15% overall). However, the benefits are by no means all one-sided. B2B procurement gives vendors plenty of opportunities, such as direct ordering. All three companies believe future benefits will come from industry portals, for example, chemicals, oil and gas marketplaces.

The B2B procurement software enabled *O&Gas.com* the world's largest supplier of crude oil to reduce its purchasing costs and gain an important competitive advantage. *O&Gas* processes more than 350,000 invoices annually, and awards over 40,000 contracts. The company expects a considerable improvement in the ratio of invoices to orders as well as a tangible contribution to revenue. The system will allow approximately 18,000 *O&Gas* employees direct access to Internet catalogues from which they can select material as they require it, freeing resources in the oil concern's purchasing department for more strategic tasks.

A leader in media sales and services worldwide, *Media.com* implemented e-business Internet solutions to enable it to further leverage its investment in its ERP system by extending the functionality of the system to casual users. This global integration strategy of networking the enterprise is viewed as 'e-business survival'. A change management team was commissioned to achieve this end. The numerous requests from various profit centres within the group for similar solutions showed a high level of acceptance from the user communities.

A major recruitment and employee services company, *Employee.com* implemented a full e-business suite of employee self-service applications. This was used to network more than 1400 employees in more than 200 offices, countrywide. It included an employee purchasing solution, 'expect to realise considerable cost savings in our purchasing and human resources organisations over the next several years.' It aimed to reduce administration tasks and paper flows (eg filling in forms, distribution of management information). While this functionality was

provided employee distrust of the system severely limited the benefits. The critical issues highlighted were:
To maximise the benefits:

- A very fast 'roll out' of the e-business solutions needs to be achieved for ROI.
- There needs to be full cooperation between industry partners. Increase the availability of supplier catalogues and improve collaboration between suppliers, to standardise item numbers in catalogues. 'It is only with content that you gain a win–win', for example, industry catalogues. This underlines the importance of the B2B value chain.
- Finally, to make effective use of a B2B industry portal requires 'organisational culture readiness' from all partners.

To minimise the barriers:

- The procurement applications need to be much more user-friendly. Easier linking of ERP data to Internet with a greater variety of BAPIs. 'We need to understand the environmental factors including IT infrastructure.'
- Corporate paranoia is in the minds of managers and consultants. Change management needs to be addressed and practiced.
- Avoid IT-driven project mindsets – this promoted resistance to change and most complaints and suggestions related to technical issues
- In the future, all four organisations believe their ERP technology will play an integral part in helping these established enterprises build and operate online B2B models. In particular, the B2B e-procurement developments could lead to industry-specific or private e-marketplaces.

In summary, by allowing employees appropriate access to purchasing systems:

(i)   *Biotec and O&Gas* were able to *reduce costs* in purchasing and lower inventory through standardised catalogues, standardised vendor interfaces. The open catalogue interface will enable sharing of profits between companies and their preferred vendors.
(ii) *O&Gas'* procurement solutions enabled the organisations to benefit from *revenue generation*.
(iii) In all cases, the e-ERP solutions enabled the organisations to benefit from *process improvement*.
(iv) The employees in all cases were able to benefit from *efficient service*.
(v)   In all cases, the e-procurement applications offered collective use of many functions or 'shared services' across groups.

Finally, the cases represent a new approach towards cost reductions for all partners. In maximising the benefits and minimising the barriers, the focus has moved beyond harnessing employee self-service issues to major change in the quality-of-work life (QWL). This

Table 6   Business-to-customers B2B^C

B2B interaction (level)	Case alias[a]	B2B sub-class	e-Business example	No. of users
ERP to customers	(10a) Comptec.com (cross-divisional)	B2B^C	e-Sales across a global network of divisions, within a conglomerate	~11,000
Multiple ERP to customers	(10b) Comptec.com plus 2 Divisions	B2B^C	e-Mall of three e-sales divisons across a global network	~11,000

[a]Two cases representing one industry, ordered by increasing level of B2B interaction.
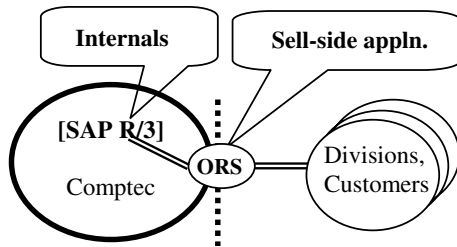

Figure 6 B2B^C model of an e-Shopfront for corporate customers.

QWL factor referred to the extent to which employees found their jobs more enjoyable and their interactions more productive, and also the belief that they were being empowered to make decisions related to their responsibilities. This is a major concept within the staged maturity model defined by Venkatraman & Henderson (1998).

B2B^C cases   The cases profiled in Table 6 demonstrate the use of an e-business 'sell-side' application. This category of e-business applications links a company's ERP catalogues and ordering processes to an intelligent Web site, for example, SAP's Online Store. It represents a second or third stage of an e-business implementation. The motivation for these developments or business driver is optimisation of order processes, cost reductions and customisation of products and services.

Comptec has its own ERP solutions for sell-side systems: the 'Order and Request System' (ORS) was developed by the parent company's Business Services group and has been deployed in eight European countries. The system was developed to optimise processes between *Comptec* and other divisions and institutional customers (Figure 6).

Comptec's business revolves around independent partners known as *valued-added* resellers and *key accounts*. In the past, system orders from partners were taken over the phone or in writing and then typed manually into the ERP system. To make ordering faster and more secure, partners now submit their orders to *Comptec* fully electronically via the Internet. During the main periods of access (from 11 am to 4 pm), an average of one sales order with 6.5 items is received every 30 s and an average of 600 order tracking requests.

In parallel to its release at *Comptec* in Germany, the ORS was rolled out on an international scale. Initially, it was deployed in England, France and Italy, and in 2000 Austria, Belgium, Spain and Switzerland followed.

B2B^C interaction for improved sales efficiency and reliability, and customer services   For *Comptec*, the effect of integrating ERP systems with the Internet greatly improved the efficiency aspects of B2Bc sales side. By November 1999, some 80% of orders from 2200 key accounts throughout Germany were handled by ORS. Also, there was reasonable acceptance by the end-users, with less order errors aided by the reliability of the data.

IT was the main driver in this 'sell-side' B2B implementation. In addition to standard features such as the ability to browse a catalogue, collect items in a shopping cart and place an order, ORS provides the following capabilities:

- Premium Pages; the user's specific list of commonly purchased items.
- Order Tracking; the ability to follow the progress of an order.
- Document Tracking; an extension to Order Tracking, which allows the electronic documents to be viewed.
- Help Facility; with information on setup, FAQs and a Help Wizard.
- News Forum; for announcements and customer debate.
- Download page; additional tools and documentation.
- News channel; notification of events, as chosen by the customer.

Comptec summarise the benefits they and their partner received as shown in Table 7.

e-Mall as B2C interaction of a seller group with customers   'e-Mall' is an Internet marketplace for a group of companies to sell their products and services to their business customers. The system architecture has the capability to connect and interact with a range of *Buyer* company ERP systems (see Figure 7).

By June 2000, the company's e-Mall had progressed to version 2 with three companies: *Comptec; AutoParts; and Medical*. The intended benefits of e-Mall flow from the streamlining of 'sell-side' business processes:

- Partner group-specific product presentation.
- Integration of Group's products/materials systems.

Table 7   Integrated enterprise systems benefits scorecard

Comptec benefits	Partner benefits
● *Presentation of configurable products on the Internet*	● *Available 24 h a day, 7 days/week*
● Ordering times optimised through online connection	● *Simpler ordering, resulting in savings in cost and time*
● *Incorrect orders reduced to minimum*	● *Automatic online information on order changes and delivery notifications*
● *Shorter and therefore faster ordering times*	● Tracking of orders at any time
● Information management	

- 'One face' to the customer.
- Sales presence 24×7 and worldwide.
- Empower customers when ordering from efficiency to effectiveness using the visual more visual power and up-to-date power of the Web.
- Empowering customers (members) through the development of an e-community.

In maximising the benefits and minimising the barriers, the focus has moved beyond customer self-service issues to customer care.

B2B^S and B2B^C integration between a supplier's and customer's ERP

The cases profiled in Table 8 demonstrate the integration of two e-business applications. This category of application links a supplier's 'sell-side' application and customer's 'buy-side' application with ERP via the Internet, for example, SAP 'Online Store' with SAP 'B2B Procurement'. It represents a mature stage of an e-business implementation. The motivation for these developments or business driver is cost reductions and customised products from B2Bc interaction. The case represents the most simple form of a private e-marketplace.
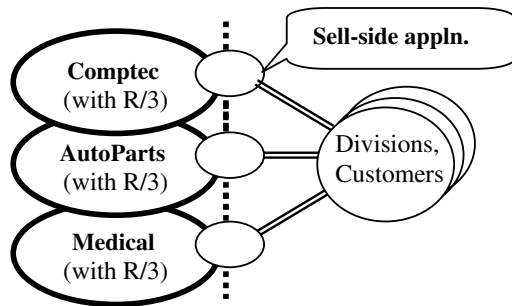
B2B integration of ERP between two organisations for complementary benefits SAP and *Comptec* have been conducting e-business since December 1999 in a point-to-point Internet buying and selling solution. They have implemented an all-SAP sell-side system called 'Order and Request System', which is based on the 'SAP Online Store' Internet application components with extensions. The solution links the SAP B2B procurement solution to Comptec's ORS via the Internet; the implementation of the Order and Request System is realized through Comptec's Business Services.

The B2B^C+B2B^S model for the integration of Customer and Supplier ERPs is illustrated in Figure 8.

B2B integration of ERP between two organisations for complementarybenefits In 2000, *PCsell* pioneered its first B2B 'B2B e-Business Integration' with one of its largest customers (*Customer.com*). This case illustrates a first-stage system architecture migrating to inter-enterprise computing. In this example, the integration of the system architecture is made possible through a variety of 'back-end', 'sell-side' and 'buy-side' systems.
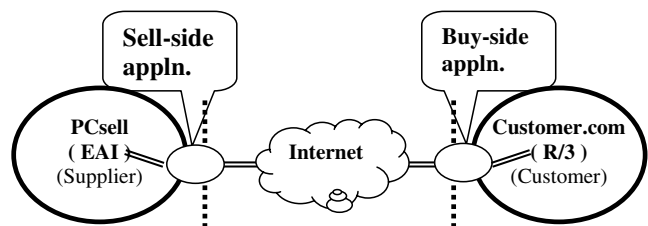

Figure 7   e-Mall as a Group of B2C e-Storefront for customers.

Figure 8   B2B model for case 11: supplier linked to a customer.

Table 8   A case study of B2B^S with B2B^C

Case alias	Size	Country	B2B sub-class	Project title	Users
(10c) Comptec.com (linked to)	Global	Netherlands	B2B^C with	Order Request System integration with	~40,000
SAP.com	Large	Germany	B2B^S	ERP B2B Procurement	
(11) PCsell.com (linked to)	Large	USA	B2B^C with	Customised online sales integration with	~27,000
Customer.com	Large	USA	B2B^S	Staff MRO procurement	~14,000

Key: Small <100, Medium <1000, Large (national), Global (multi-national)

Table 9   Integrated enterprise systems benefits scorecard

PCsell.com benefits	Customer.com benefits
● *Presentation of configurable products on the Internet*	● *Available 24 hours a day, 7 days/week.*
● Control and standardise procurement process	● *Simpler ordering, resulting in savings in cost and time*
● *Increase order accuracy and efficiency*	● *Automatic online information on order changes and delivery acknowledgements*
● *Reduced order cycle times*	● Extend existing infrastructure to the web for use by all our suppliers
● Provides a model for use with all customers with ERP systems	

Table 10   B2B benefits scorecard with e-business integration

B2B model benefits	B2E	$B2B^S$	$B2B^C$ and (B2C)	$B2B^S$ with $B2B^C$ integration
Reduced costs	1	5, 6, 8, 9	10a, 10b, (3 ,4)	10c, 11
Efficient service	2, 7	5, 6, 8, 9	10a, 10b, (3, 4)	10c, 11
Shared services	1, 2, 7	5, 6, 8, 9	10a, 10b	10c, 11
Revenue generation	—	8	10a, 10b, (3, 4)	10c, 11
Quality of work life	1, 2, 7	5, 8	—	10c, 11
Process improvement	—	5, 6, 8, 9	—	10c, 11
Customised service	—	—	—	10c, 11
Alliance building	—	5, 6, 8	10a, 10b, (4)	10c, 11

Customer.com was able to leverage its existing SAP 'back-end' system and SAP Business Connector to communicate directly with *PCsell's* component-based e-business system. This integration automates the e-procurement of all computer products via the Internet.

Performance gains   Within the issue of performance gains, improved customer response and an expanding customer base were seen as most significant. As a measure of its success and acceptance, this e-business solution is expected to include the B2B e-procurement of office equipment and supplies. Table 9 shows the similarity of the expected benefits from two different business networks.

The performance gains for e-procurement were achieved from two sources; 25% cost savings, and reduced cycle time from 2 weeks to 2 days, and access to (real-time) customer data via ERP technology. The project enabled efficiency gains from the minimising of delays in customer orders, and effectiveness gains from optimising employee/staff time. For example; fewer complaints, improved management of the customer, increase by 50% for online orders (sales), and a growth in corporate sale of 45%. Also, online access to real-time data for deciding on the optimal employee orders. The cost savings through operational efficiencies of all equipment resourcing compare favourably to those cost savings in other e-procurement case studies. In the *Biotec.com* case study, the gains appear to be less; 20% cost savings, and reduced cycle time from 2 weeks to 4 days. However, improvements for staff in the quality of work life appear the same.

In maximising the benefits and minimising the barriers, the focus has moved beyond self-service and care issues to customer and employee empowerment (Markus *et al.*, 2000):

● Empower customers with more effective and efficient ordering using the more visual and up-to-date power of the web.
● Empowering customers through the development of an e-community.
● Empowering employees with decision-making skills.

Summary of findings

The findings are analysed according to the stages of sophistication of the e-business interaction models. Collectively, they demonstrate that greater benefits flow from increased level of e-business interaction as shown in Table 10. The table is used to identify only those cases that were observed to have realised some benefit. For example, within the $B2B^S$ model, employees of *Biotec* (5) and *O&Gas* (8) reported an improvement in the quality of work life, whereas employees of *Employee.com* (9) were frustrated by their new systems. In this example, the power of complementary benefits is easily demonstrated. While both companies (5) and (8) reaped the benefits of reduced item costs in procurement of supply, their employees benefited from their involvement and the reduction in the order cycle time from order-to-delivery. In case (9), the employees found the online ordering frustrating, and preferred to use the old paper-based system. This negated the savings in purchasing items from preferred suppliers for *Employee.com*. Similar complementary benefits were found to exist in all classes of B2B models.

To realise the superior benefits, the following critical factors were found to apply: (i) continuous improvement of the quality of the web interface from the end-user's
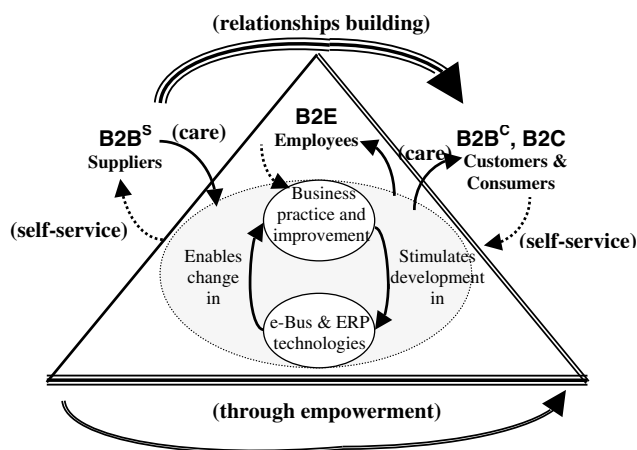
Figure 9 Relationships building cycle model from staged growth of e-business.

perspective, (ii) formalise an agreement with partners on a common IT platform, (iii) standardise purchasing agreements with suppliers, and (iv) communicate the business strategy to employees.

Figure 9 is developed as a conceptual model to bring together the key elements and their relationships of this study into e-business transformation. This model illustrates how changes in industry practices and e-ERP developments relate to B2E, B2C and the $B2B^S$, $B2B^C$ models. It identifies that there is an accelerated symbiotic relationship between e-business technologies and business improvement caused by a shift in customer demand. The arrows connecting customers, employees, suppliers indicate the business interactions through self-service, care and empowerment towards extensive relationships building with multiple alliances.

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

- To offer cheaper products with efficient service by utilising customer *self-service* in $B2B^C$, and customer *self-service* in B2C.
- To procure materials cheaper through e-procurement agreements by utilising employee *self-service* in $B2B^S$.
- To optimise both $B2B^S$ and $B2B^C$ for customised service by utilising employee and supplier *empowerment* in B2E.
- To generate effective *alliances* through B2E, B2C, $B2B^C$ and $B2B^S$ with all players in the e-ERP environment.

Figure 9 represents a complete view of the foundations of this study; e-ERP technology, e-business practice and multiple relationships building.

Conclusions
The early adopters of e-business applications show a trend towards realising benefits from e-procurement

and self-service applications, for customers and employees. To maximise the benefits from these types of applications, employee involvement is essential. Combined, these applications offer use of many functions and shared services across operational and administrative groups. All this relies heavily on employee self-service and leads towards new work roles.

Standardisation of both business processes and vendor catalogues is a way to drive cost reductions in supply chain management. This in turn improves services and leads to more effective customer and supplier relationships. Recently, organisations have begun to undertake revenue generation from e-Stores and e-Malls. A complex case with B2B e-business integration of a global computer supplier and a large corporate customer demonstrates the integration of e-business applications across ERP systems. With web-based technologies this provides an enterprise architecture for optimising the overall B2B value chain. The case is used to emphasise the synergistic benefit stream from B2B e-business integration of the B2B interaction models. The final case demonstrates the integration of ERP and non-ERP systems, using web-based technologies, to provide the infrastructure required to optimise the overall B2B value chain. The study is used to emphasise the synergistic benefit stream from B2B integration and the interaction of inter-organisation e-business solutions. Collectively, the cases demonstrate that greater benefits flow from increased levels of e-business interaction.

Many organisations have begun to undertake e-business initiatives to meet strategic goals. They recognise, however, that they will only accomplish their objectives through people. This emphasises the need to place increasing importance on improving the quality of work-life issues. If effectively managed, employees should ultimately be more productive in their work tasks and better able to serve customers, suppliers, and business partners. A candidate model for future research on e-business implementations with ERP is proposed as a B2B interaction model (Figure 1). In this model, the realisation of complementary benefits for all business partners is viewed as necessary and sufficient for a measure of success.

The overall findings from the set of e-business cases demonstrate that three stages of the business interaction model (B2E, B2C, and $B2B^S$ with $B2B^C$) provide a framework for studying e-business benefits. These three stages typically progress through three levels of benefits: self-service, care and empowerment, relationships building. While this research found an important role for ERP in support of e-business, the message from these case studies is that the business model should drive an e-business implementation, not the technology (Fan *et al.*, 2000). Managing the transformation process through several stages of e-business process change is critical for success.

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