



Strategic technology adoption: extending ERP across the supply chain

Strategic
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adoption

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Abstract

Purpose – This article proposes examining how small to medium-sized organisations (SMEs) are responding to the challenge of harnessing enterprise resource planning (ERP) and internet technologies to enhance performance and improve competitiveness and aims to identify the barriers preventing organisations from harnessing these technologies.

Design/methodology/approach – A case-based research strategy was chosen. Four leading SMEs were interviewed to determine their approach to extended ERP and the barriers encountered. The primary data collection was based on structured in-depth interviews with key respondents who were involved in the implementation of extended ERP and closely involved in day-to-day operations.

Findings – While each of the SMEs had already taken some steps to extended ERP, they adopted a cautious approach to the future. In short, SMEs considering extended ERP should determine the impact on all organisations before proceeding and should also apply the lessons learned from their initial ERP implementation.

Research limitations/implications – Single company case studies could be used to uncover some of the causal mechanisms behind the processes observed. Within-sector case studies could be used to highlight the issues faced by particular sectors. Cross-sector case studies could be used to validate the article's conclusions as well as to elucidate differences among sectors.

Practical implications – Managers of SMEs embarking on extended ERP should consider the following challenges: business processes, whether internal or external, must be examined and redesigned as necessary to take advantage of the new technology; an effective change management and communications programme must be run; the lessons learned from the original ERP implementation should be revisited and mistakes made in the past avoided; and a strong business case needs to be developed, with clear objectives and critical success factors.

Originality/value – While the internet has facilitated a shift towards dynamic communication and improved integration, the complexity of integrating electronic supply chain management, e-procurement and customer relationship management poses an enormous challenge for organisations. This research study indicates that there are multiple ways in which extended ERP can be achieved to add value to SMEs but it is not simply a matter of adding a new application.

Keywords Manufacturing resource planning, Small to medium-sized enterprises, Internet, Supply chain management, Customer relations

Paper type Research paper

Introduction

In the late 1990 the internet allowed organisations to share data in a relatively straightforward manner. Software firms were quick to take advantage of this new opportunity and new



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enterprise applications emerged. These included electronic supply chain integration (e-SCM), e-procurement and customer relationship management (CRM) all of which could be integrated with the organisation's enterprise resource planning (ERP) (see Table I).

Many studies have concluded ERP systems can bring benefits in operational efficiency and reduced costs to organisations and enforce a discipline of best practice and consistency (Mabert *et al.*, 2001; Van Everdingen *et al.*, 2000; Edwards *et al.*, 2001). Organisations that initially improved internal processes through ERP are now examining how ERP and the internet can help them improve processes which extend beyond the enterprise to their customers and suppliers. However, little research attention has been focused on combining ERP and internet technologies in organisations, especially SMEs. The primary purpose of this paper is to explore how SMEs are responding to the challenge of harnessing ERP and internet technologies to enhance performance and improve competitiveness and to identify the barriers preventing SMEs from harnessing these technologies.

Review of the literature and research question

Organisations that have implemented ERP systems need to reflect on whether they want to take advantage of new technologies and extend their business processes over the internet. Extended ERP refers to the inclusion of additional modules such as CRM, supply chain planning, integrated e-commerce, sales force automation, decision support and human resources to the core foundation modules of internally focused established ERP systems (McKie, 2001). The internet has brought about a revolution in supply chain thinking. The low cost and ease of use of the internet has greatly enhanced attempts to connect supply-and-demand chains across the organisations (Davenport and Brooks, 2004). They contend that organisations are motivated for cost-cutting reasons to increase efficiency across the extended supply chain and to enhance customer service and network relationships. This literature review highlights the key issues facing organisations extending their ERP systems to embrace e-SCM, e-procurement and CRM which are the focus of this research.

The e-SCM challenge

SCM has been defined as:

[...] the systemic, strategic coordination of the traditional business functions and the tactics across these business function within a particular company and across businesses within the

	Foundation ERP	Extended ERP
Functionality	Financials Distribution Manufacturing Human resources and payroll	Salesforce automation Customer relationship management Supply-chain planning Integrated e-commerce
Technology	Modular deliverables Two-tier architecture Integrated e-mail Online analytical processing (OLAP) connectively Customisation tools	Component deliverables The <i>n</i> -tier architecture Fully integrated workflow Fully accessible business-logic applications programming interface (API) Fully integrated data warehouse

Table I.
Deliverables for
foundation and extended
ERP

supply chain, for the purposes of improving the long term performance of the individual companies and the supply chain as whole (Mentzer *et al.*, 2001, p. 18).

SCM embraces the following key components:

- the movement of product through the supply chain;
- the management of the associated information flows;
- the management of business relationships; and
- the creation of customer value.

In this context, e-SCM focuses on the management of information flows and represents a philosophy of managing technology and processes in such a way that the enterprise optimises the delivery of goods, services and information from the supplier to the customer. However, for organisations to take advantage of e-SCM capabilities they must ensure that their own ERP systems are implemented correctly beforehand. Without properly functioning ERP systems, e-SCM may do nothing more than create upstream and downstream problems at internet speed (Norris *et al.*, 2001). This requires change across the supply chain – change in management practices, performance metrics and business processes. Two major factors underpin the success of e-SCM (Norris *et al.*, 2001). First, all firms involved must view collaboration as a strategic asset and an operational priority in order to foster trust among trading partners and second, information visibility across the supply chain should be managed with strict policies, disciplines and monitoring.

In respect to the first of these factors, organisations wishing to integrate their supply chains need to embrace collaboration. Organisations that are already communicating with each other need to move to the next phase where they are co-ordinating on a timely basis before they can collaborate, i.e. share information electronically. Collaboration implies visibility of internal activities and metrics by external parties. An organisation's ability to perform is therefore a lot more transparent, and therefore puts pressure on the organisation. Managers need to be rewarded on how they optimise the entire supply chain rather than their own specific link. People throughout the organisation need to be able to manage the impact of having a faster flow of information.

Collaboration also implies good business relationships. Indeed, Scalet (2001) suggests that one of the main challenges organisations face when implementing e-SCM is the partnership challenge, as they do not have control of their partner's systems. Relationships with business partners are therefore of paramount importance to the success of e-SCM initiatives. All parties need to recognise that success for one part of the supply chain means success for all.

Moreover, Sarkis and Sundarraj (2000) suggest that e-SCM provides organisations with significantly increased strategic options for achieving long-term flexibility and adaptability. With the growth of e-commerce, customers are demanding faster turnaround and greater customisation than ever before (Van Hoek, 2001). At the same time, organisations are looking for innovative ways to make their businesses more consumer-centric. They need to improve their relationships with customers to create customer loyalty and e-SCM is perceived as the vehicle to achieve this. e-SCM also levels the playing field between large and small organisations, allowing any size enterprise to access suppliers and customers around the world.

On the other hand, Porter (2001) cautions that the advent of internet technologies alone will not help firms achieve competitive advantage. He acknowledges the impact of the internet on the supply chain and asserts that it is the most powerful tool available today for enhancing operational effectiveness as it allows the exchange of real time information thereby creating improvements throughout the value chain. However, he cautions that the advent of internet technologies alone will not help firms achieve competitive advantage as traditional sources such as scale, human resources and investments in physical assets continue to play prominent roles. Indeed, the open nature of internet technologies makes it easier for organisations to use them. This minimises the opportunity for them to deliver competitive advantage.

With respect to the visibility challenge, if e-SCM allows information visibility across the supply chain to become a replacement for inventory it must be managed with strict policies, disciplines and monitoring. Exchange of accurate and up-to-date information will help organisations share best practices. Relationships built on trust between the partners can contribute to competitive advantage. Traditionally relationships in supply chains have focused on shaving the supplier's margin. However, in a collaborative environment organisations need to optimise the processes for their mutual benefit. Allowing all partners in the supply chain to view and dynamically manage both demand and capacity data raises opportunities for the simultaneous improvement in customer service levels and the reduction in overall inventory levels and associated costs, (Kehoe and Boughton, 2001). However, organisations willing to share information with the supply chain partners may be few. Many organisations believe that their own information gives them a crucial competitive advantage and have no desire to share it freely (Agrawal and Pak, 2001).

Furthermore, Lee *et al.* (1997) suggest that information exchange can help avoid one of the best-known problems in the supply chain: Forrester's bullwhip effect. The theory says that irregularities and unpredictability in order quantities increase with the number of layers in the chain. This theme is supported by Kehoe and Boughton (2001) who state that the internet provides the ability for demand data and supply capacity data to be visible to all organisations within a manufacturing supply chain and, as such, organisations are in a position to anticipate demand fluctuations and respond accordingly.

However, Kehoe and Boughton (2001) argue that total cycle time compression and inventory cost reduction will only occur when the entire supply chain is optimised rather than individual enterprises. Kennerley and Neely (2001) draw the same conclusion, stating that all steps in the supply chain from design to after sales service must become an integrated flow of information. However, Koch (2001) highlights the inherent complexity involved because he considers the e-supply chain as an enhanced network. Instead of being linear and fixed, he suggests it is a complex but well-defined web of relationships with multiple channels and an open flow of information. As a result, modern organisations need to embrace rapid, complex and fundamental change. Businesses have to work directly with customers, suppliers, partners, and sometimes even competitors, in order to respond more quickly and intelligently to change.

The e-procurement challenge

The discussion so far has focused on e-SCM in terms of machine-to-machine or ERP-to-ERP activity, i.e. the automated transfer of information between organisations but

it is also important to analyse the impact e-procurement has on ERP solutions. E-procurement is defined as intercompany trade where the final order is placed online (Deloitte Consulting, 1999). E-procurement is more than just a system for making purchases online. A properly implemented system can connect companies and their business processes directly with suppliers while managing all interactions between them. This includes management of correspondence, bids, questions and answers, previous pricing, and multiple e-mails sent to multiple participants (Burt *et al.*, 2003). E-procurement can take place in an e-marketplace (defined as “marketplaces implemented by use of telematics, which means mechanisms of market-typical exchange of goods and services, which support all phases of the transaction” (Schmid, 1993)) or directly between two organisations and the software automates the purchasing process using internet technologies. Requisitioners can access the system via a standard browser where they are routed to company approved catalogues either internal or external.

A 1999 survey of over 200 global corporations by Deloitte Consulting (1999) details many of the reasons organisations are adopting e-procurement and the benefits they are deriving from it. The main benefits include: transaction cost reduction, self-service approach and integrated supplier management. The survey found that despite the advantages of ERP systems, procurement processes were still problematic and inefficient. Fragmentation of the supply base and the user community are a significant problem as they can reduce the organisation’s ability to take advantage of corporate contracts, partnership arrangements and established infrastructure. Organisations also reported that employees were spending significant amounts of time on low value add purchasing transactions rather than strategic activities such as vendor management and that e-procurement applications have generally been targeted at indirect goods.

One of the key challenges facing e-procurement is the impact of netmarkets (Pawar and Driva, 2000). Netmarkets are defined as:

[...] an online intermediary that connects fragmented buyers and sellers which can eliminate inefficiencies by aggregating offerings from many sellers or by matching buyers and sellers in an exchange or auction; they form around specific industries and are thus referred to as “vertical” markets (Burt *et al.*, 2003).

While linking to internal catalogues or the suppliers’ external catalogues helped the procurement process, software vendors realised that an aggregated model would be far more efficient. This allows buyers to access several sellers by accessing a single external e-marketplace. While netmarkets are still very much in their infancy, their promise is virtually unlimited. However, Pawar and Driva (2000) highlight the many difficulties these e-marketplaces face. First, business processes need to be extended across the entire netmarket, i.e. all participants need to sign up to an agreed way of doing business. Secondly, the participants need to reflect these processes in their systems, i.e. integrate with their existing back office (ERP) systems. Netmarkets face the classic chicken-and-egg syndrome in that they require scale to show that they can provide real value to participants and in order to attract participants they must demonstrate that they can add value (Berryman and Heck, 2001).

The CRM challenge

The final link that needs to be addressed is the integration of ERP and CRM. ERP systems contain vast amounts of data about customers and integration between these

two applications is vital. Proper integration can provide the ability to access any customer information, including service issues to avoid being blind-sided by complaints when making a sales call (James and Wolf, 2000).

Zefer (2001) highlights many of the high-level benefits. First, organisations can control who sees what, when, and why, allowing them to improve customer segmentation, up-sell, and limit or eliminate risk. Second, organisations can improve the communication and productivity between suppliers, partners and customers. The list of other benefits included speed time-to-market, speed delivery times, improved customer service, satisfaction, order management, decision making, forecasting and warehouse/distribution activities, reduced paperwork and inventory, added value to commodity products, shortened cycle times and strengthened partnerships. Organisations face a number of integration, interoperability, and performance challenges when they link their CRM solutions to back-office systems. A successful CRM strategy must include access to back-office information and the ERP data must be merged with the functionality of CRM (Pender, 2001).

Summary

While the internet has facilitated a shift towards dynamic communication and improved integration, often ahead of the physical movement of goods, the complexity of integrating e-SCM, e-procurement and CRM poses an enormous challenge for organisations. A core issue confronting all organisations when extending their business processes over the internet and replacing their legacy systems is the decision whether to choose best-of-breed systems or an ERP system. A best-of-breed system provides the best product available for each system function (Windsor, 2001). For example, the firm would choose a separate finance package, a separate sales package and a separate production package. The advantage is that the firm should get the system and functionality they want. O'Leary (2000) documents some of the disadvantages of the best-of-breed approach: higher search costs, different look and feel per application, integration costs, diversified skillsets required to support them and synchronisation issues due to different upgrade timetables. Windsor (2001) counters these points saying that best-of-breed vendors are investing hugely in integration and the ERP vendors are promoting their application partnerships, i.e. they making it easy for best-of-breed solutions to integrate with them.

Organisations can derive value from their ERP implementations through a programme of continuous business improvement both within the enterprise and by extending processes to partners. With respect to supply chain integration, internet technologies have opened enormous possibilities for organisations to share data. However, the adoption of an integrated approach throughout the supply chain requires a trade-off between autonomy and control between each supply partner relationship (Graham and Hardier, 2000). Partners in virtual integration need to be willing to allow partners to view their systems and processes in order for the end-to-end process to work correctly and organisations also need to understand the implications of integration across the entire supply chain (Venkatraman and Henderson, 1998). Organisations wishing to extend their processes will have to develop more trusting and collaborative relationships with their business partners. While extended ERP allows information quicker and reduces the period of uncertainty it still need to be managed.

The advancement of communications technologies has allowed those organisations that have taken advantage of its capabilities to gain competitive advantage over their competitors (Graham and Hardier, 2000). They also see a blurring of the boundaries between the marketplace (i.e. the physical location(s) where goods are bought and sold) and the market space (i.e. the location on the internet where companies can obtain or disseminate information, engage in transactions, or work together in some way). They contend that the internet is key in propelling businesses in new directions in both the marketplace and the market space and that successful organisations are reaching new levels of integration. They can build on their ERP backbone integrating through e-SCM, e-procurement and CRM.

Despite the wealth of academic and industry literature that concludes that implementing ERP does lead to process improvement and better ways of doing business, there is a lack of research on how SMEs are extending the capabilities of their ERP systems outside the bounds of the enterprise. While many factors have been put forward in the literature to explain the successful performance of SMEs it is generally assumed that findings and prescriptions about SMEs performance are equally applicable to large and small companies (Voss *et al.*, 1995). We believe SMEs are confronted with different set challenges when implementing extended ERP. This paper attempts to address this gap. The primary purpose of the research is to examine how SMEs are responding to the challenge of harnessing ERP and internet technologies to enhance performance and improve competitiveness and to identify the barriers preventing SMEs from harnessing these technologies.

Thus our underlying research questions are:

RQ1. How are SMEs responding to the challenge of harnessing internet technologies and ERP?

RQ2. What are the barriers preventing SMEs from harnessing these technologies?

Methodology

Given the nature of the research agenda, a case based research strategy was decided on. Case-based research is an empirical enquiry, which investigates a contemporary phenomenon within its real life context when the boundaries between phenomenon and context are not clearly understood (Yin, 1989). Multiple sources of evidence are used and this allows for in-depth interviews, and documentary information to be analysed and understood within context. Usually access to research sites and within case access to data are the major problems associated with case-based research studies. This was not a problem with the sites selected for this research. In the final analysis, the open-ended nature of the research questions and contemporary nature of the phenomenon within its real-life context dictated a case-based research strategy approach.

The primary data collection was based on structured in-depth interviews with key respondents involved in the implementation of extended ERP and who were closely involved in day-to-day operations. Given the nature of the research questions the researchers felt that in-depth interviews based on the views and experiences of the key individuals in the project teams involved in the implementation of extended ERP would be most insightful. These in-depth interviews allow for more meaningful follow-up questions to be asked and answered and result in more extensive findings and insights. The

interviews were conducted with the entire core project management team in the selected SMEs; in total this amount to 36 executives across the four organisations. All respondents interviewed played key roles in the initial ERP implementation and were involved in the on going extended ERP and direction of IT investments within their organisation. In addition, access was given to all management reports and minutes of meetings and other secondary sources of information. The authors administered the interviews over a two-month period. The interviews were recorded and transcripts were made. These were analysed using the qualitative data analysis software program called Non-numerical Unstructured Data Indexing Searching and Theorising (NUD.IST). This is a computer package designed to aid users in handling non-numerical and unstructured data in qualitative analysis. NUD.IST does this by supporting processes of indexing, searching and theorising. NUD.IST helps users to manage, explore, and search the text of documents, develop ideas about the data, link ideas and construct theories about the data, test theories about the data, and generate reports including statistical summaries.

It was decided to select SMEs from a range of industries to indicate the scope of ERP functionality and therefore the potential multiple opportunities for extended ERP. We use here the standard definition of the SME as an independent company with between five and 200 employees (Stanworth and Curran, 1981). Four SMEs from the distribution, manufacturing, transport and software industries, all leaders in their industry sectors, were selected from the SAP installed base in Ireland to which the authors had access. These four firms were felt to be most suitable because they came from the SME sector and had implemented SAP in the last four years, and the decision to install SAP would have been made locally unlike many of the foreign multinationals in the database.

Company profiles

Company one (C1) is one Ireland's largest distributor of computer, networking and computer peripherals products and leading brands in the IT market. The products are distributed to customers through a network of over 200 value added resellers and systems integrators. C1 offers specialised configuration, network design and staging services that allows resellers to position bids for large corporate contracts.

Company two (C2) is part of the localisation, manufacturing and distribution division of a major Irish value added marketing and distribution group. The group operates principally in growth segments of the IT, energy and healthcare markets. It provides outsourced supply chain management solutions to leading global manufacturers in the IT and telecommunications sectors and provides a full turnkey service for the manufacturing needs of software organisations and for the media and documentation requirements of hardware origin equipment manufacturers (OEMs).

Company three (C3) is a publicly quoted transport and leisure group with headquarters in Dublin. The Group's activities include the transportation of passengers and cars, Roll on Roll off freight, door-to-door container freight, cargo handling, ferry chartering and travel services, both online and over-the-counter.

Company four (C4) is a leading provider of global e-security solutions. With more than 10,000 customers in more than 50 countries, it helps businesses in diverse industry sectors such as financial services, government, technology, telecommunications, utilities, and healthcare meet their security challenges.

Discussion of findings

The following section presents the findings of the research around the central theme of how SMEs are facing up to the challenge of harnessing internet technologies and ERP and the barriers preventing them from harnessing these technologies.

Challenges for SMEs are:

- The approach of SMEs to extended ERP is cautious and is driven by customer demand.
- From a supplier perspective, extended ERP is driven by their larger partners.
- Lack of integration of internal processes is causing problems because extended ERP alters existing the process.
- Lessons learnt from original ERP implementation need to be revisited.
- Full benefits of ERP are not initially visible; therefore there is a need for a change management programme because mutual benefit approach difficult for firms to take on board.
- Implementing extended ERP is changing career prospects: power increasing devolving to individuals who embraced the IT agenda.
- Trust is paramount for SMEs because of fears related to passing performance information to customers and suppliers.

Our first finding from our interviews indicates that there is much interest in extended ERP but it is being approached cautiously. None of the SMEs is taking a proactive approach to implementing Extended ERP. All are approaching this cautiously, essentially believing that it will happen but they do not intend to push their partners towards it yet. The reasons for this are the absence of a push by the business and the belief that partners would encounter technical difficulties setting up the interfaces.

C2 indicated that they were being driven by their customers or prospective customers to integrate their supply chain. They also indicated that they were not driving their suppliers towards supply chain integration nor were they being driven by them. C1 have to date adopted a cautious approach towards supply chain integration but in an effort to reduce costs expect to drive this forward with both customers and suppliers over the next 12 months. On the other hand, C4's concern in this area was that of the dominant player concentrating on dictating the scope and pace of the integration effort. They believe SMEs suppliers will inevitably be driven by the demands of their larger partners. The literature contends that the entire supply chain must be integrated electronically for full benefits to be felt. While this is true the benefits of integrating pairings along the supply chain should not be overlooked.

Our second finding is that there is evidence that the lack of integration of internal processes is causing problems. As an example of this problem, C1 indicated that the due dates of its out-of-stock items displayed on their web site is incorrect because they cannot get their own supplier to give them accurate lead times. Executives complained that data clean-up was particularly time consuming as many legacy systems were involved. While this complaint is valid it must be noted e-SCM is not simply a matter of connecting a series of internal processes across partner organisations: rather, e-SCM will alter the process as it is fully integrated across the partner organisations. If e-SCM is the "digital nervous system" of the wired world then business processes need to be redesigned from a holistic viewpoint to span the enterprises they are affecting. If

e-SCM is all about relationships, then trust amongst the parties is paramount to its success of e-SCM. Supply chain members must realise that all improvements made to the operation of the supply chain will ultimately benefit all member firms. This mutual benefit approach will be difficult for many firms to take on board as they have focused on squeezing margins with their suppliers rather than co-operating with them. Norris *et al.* (2001) have stressed that before an organisation can participate in e-SCM it needs to ensure that its internal processes are fully integrated. The assertion is that processes that span the supply chain cannot work if the internal processes do not work correctly in the first place.

Our third finding is that a major company-wide change management programme will be necessary to train people to accept change and to get them to do business in a totally new way. Senior management will need to get people to embrace extended ERP as a process and not an episode in the company history. A number of the executives in the implementation teams suggested that senior management responsible for the direction of the company should undergo technical training to come to terms fully with the nature of the project. All the SMEs engaged the skills of consultancy specialists in the relevant areas.

Our fourth finding is that the full benefits of ERP were not initially visible or fully experienced by everyone. However, the benefits became more visible over time when the system became stable and users had time to adjust to the new working practices. In addition, the process changed the career prospects and aspirations of many people in the company. Power was perceived to move strongly in the direction of people who had embraced the IT agenda. As a result, management felt that there was a certain amount of inertia had set in and that it was going to be difficult to bring people along to accept the challenge of an extended ERP project. The lessons learned from the original ERP implementation need to be revisited and mistakes made then analysed. Argyris and Schön (1978) describe this as “deutero-learning” and argue that when an organisation engages in “deutero-learning” its members reflect on and inquire into previous episodes of organisational learning or failure to learn.

Our fifth finding is that not everyone is clamouring to take up the internet-enabled supply chain despite the evident advantages. There are a number of reasons advanced in the research for this. The core issue is that despite the advances in technology, integrating a supply chain remains a technically complex task. Technical expertise is required by all parties trying to integrate and match the process to the software configuration. The cost of such expertise is high whether it is in-house or hired for the duration of an integration project. All the SMEs in our study indicated reluctance on behalf of their customers to become involved in data exchange because they lacked the technical expertise and feel that these initiatives are more appropriate for larger organisations. Furthermore, the issue of trust between SMEs emerged as imperative if collaboration is to take place, but SMEs have a distrust of passing confidential information to customers and suppliers as this may indicate how well they are performing.

Our sixth finding is that there is no evidence that the e-procurement is an important issue for these SMEs. C1 and C3 expressed interest in accessing industry market places but this would be in an *ad hoc* fashion rather than part of a procurement strategy. All the SMEs felt that their indirect goods are too low value to warrant investment in e-procurement software. Industry analysts have predicted procurement is the real

beneficiary of web enablement and that SMEs will save vast amounts by further refining their procurement processes by accessing online catalogues. Paper-based requisitions are replaced, supplier invoices can be matched to purchase orders and goods receipts online and discipline and control is added to the process. This divergence between the literature and this study can perhaps be explained by the scale of the organisations concerned. The literature review is mainly focused on large organisations while the organisations interviewed in this study are firmly within the SME sector when viewed on a global scale.

Our seventh finding is that the level of interest in CRM products was mixed among the SMEs interviewed. C1 believes that CRM may be of use to help with tracking prospects but has no plans in place at the moment. C2 has no plans to examine any CRM products as they feel that their small customer base can be managed effectively using other means. C3 despite its large customer base and multiple channels to market has no ambition or plans relating to CRM. C4 is currently engaged in rolling out Siebel. SMEs with multiple channels to market can benefit from extending their ERP systems to CRM, however, they must look beyond the current vendor market and determine exact requirements before deciding. CRM is more than just software, it is a business strategy utilising people, process and technology to enhance the customer's lifetime economic value.

Finally, when interfacing with in-house applications SMEs have mixed the single vendor and best-of-breed approach. For ERP customers the choice of a CRM system presents a strong best-of-breed versus "single vendor" challenge. However, our findings indicate that the best-of-breed vendors have led the field but ERP vendors have responded strongly as they have a huge base of installed customers to whom they can sell their product. C4 opted for the best-of-breed solution because of product maturity and functionality.

When extending ERP the best-of-breed versus single vendor" is not as significant an issue as it was for early adopters of ERP. This can be partly explained by the advancement of enterprise application integration (EAI) software or middleware and that both groups of vendors are adopting a collaborative approach and are opening their systems for integration. C2 and C4 who are generally in favour of the single vendor approach have used best-of-breed products when they found that the SAP equivalent did not provide the functionality they required.

Conclusions

There are a number of important implications for management that arise from this study. First, there are multiple ways that Extended ERP can be achieved to add value to SMEs. The options are varied and range from in house activity to interactions with external parties. SMEs can gain competitive advantage from ERP but they must embark on a process of continuous improvement and organisation learning in order to do so. Management should realise that implementing ERP is a form of what Argyris and Schön (1978) refer to as "double-loop" learning. This occurs when decisions taken are based on challenging existing knowledge and rethinking existing competencies and methods. However, for extended ERP projects, SMEs need to embrace more sophisticated approach to their learning, such as "deutero-learning". Argyris and Schön (1978) argue that when an organisation engages in "deutero-learning" its members learn from previous contexts for learning. They reflect on and inquire into

previous episodes of organisational learning, or failure to learn. They discover what they did that facilitated or inhibited learning, they invent and produce new strategies for learning, and they evaluate and generalise what they have produced.

Second, it is important for SMEs to take a long-term view. They should not consider an ERP implementation complete when they go live as there is a bedding-in period for the organisation. A temporary dip in performance post going live can be attributed to the scope of the change involved for the organisation. Going live should be regarded as a milestone on a journey towards achieving the full benefits. Moreover, the full benefits will not be visible or fully experienced by everyone but overtime when the system has become stable and users have had time to adjust to the new working practices the benefits will become more visible.

Third, SMEs will need to develop a core cross functional team of managers to drive the process and senior management will need to provide effective support for the implementation team and undergo specialist training themselves to understand the technical nature of the project. Managers will have to find ways to continuously energise their staff to accept the idea that extended ERP is a process and not an episode or act. However, the process can and will change the career prospects and aspirations of both employees and managers alike. Training and retraining will be necessary to get people to accept change and to do business in a totally different way. SMEs who do not take this route will be caught by “competitive convergence” and eventually overtaken by their competitors.

Fourth, this research indicates that there is much interest in extended ERP but it is being approached cautiously. With regard to e-SCM and e-procurement, SMEs have yet to determine their precise requirements and whether they will drive the process or be driven by their business partners. Different industry markets will respond and embrace extended ERP in different ways and with different timescales. The industry readiness state will driven by key players implementing systems thereby creating a standard solution within the industry. Other industry players will recognise that the ability to deliver on time will improve customer satisfaction and also improve customer confidence and ultimately lead to more business and that they must change in order to compete effectively with their competitors.

Finally, extended ERP is not simply a matter of adding a new application. SMEs embarking on this route should consider the following challenges. First, business processes whether internal or external, must be examined and redesigned as necessary to take advantage of the new technology. Second, an effective change management and communications program must be run. Third, the lessons learned from the original ERP implementation should be revisited and ensure that mistakes made then are avoided this time. The SMEs should hold a series of workshops with a cross section of the users of the system and members of the implementation team. These workshops will identify the causes of the current difficulties people have with the system and suggest possible solutions. Finally, a strong business case needs to be developed, with clear objectives and critical success factors.

Further research

A number of areas meriting further research have become apparent while preparing this document. First, SCM is built on relationships, the level of collaboration required leaves no room for secrecy. CRM is also about relationships, gathering information on

all customer touch points to strengthen customer loyalty and increase profitability. There must therefore be considerable overlap between SCM and CRM. Further study in this area may indicate how SMEs can put practices in place to ensure that collaboration takes place.

Change management is essential to the success of ERP implementations. The move from operational silos to a single integrated system can create many problems for SMEs if not managed correctly. Extending ERP across organisational boundaries whether through e-SCM, e-procurement or CRM has the potential to create similar problems in all participating SMEs. These issues will be more difficult to manage as each organisation can only deal with the problems within its four walls. Further study in this area could help anticipate the kinds of problems that may arise and propose measures those SMEs could take to avoid them.

With respect to future research a number of different approaches could be considered. Single company case studies could be used to uncover some of the causal mechanisms behind the processes we have observed. Within sector case studies could be used to highlight the issues faced by particular sectors. Cross-sector case studies could be used to validate our conclusions as well as to elucidate differences among sectors. Finally, a large-scale, questionnaire-based study could be used to validate statistically the results of our research.

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