

Relationships and Technology:

Combining ERP and Internet Technologies

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Abstract.

Enterprise Resource Planning (ERP) systems dominated the enterprise software market in the mid to late 1990s. Organisations adopted ERP systems to improve business processes, reduce costs, and prepare for future growth. While the rate of adoption of ERP was very high there was also much criticism for expensive overrun implementations, restricted functionality and inflexible complicated configuration and set-up.

In parallel with the rise of ERP the Internet was moving from a messaging facility used by academics and the military to a powerful communications tool that could be used by consumers and businesses alike. As organisations began to improve internal processes through ERP they also began to examine how ERP and the Internet could help them improve processes that extended beyond the enterprise to their customers and suppliers. This process of integrating ERP to supply chain management, e-Procurement and customer relationship management has been called Extended ERP.

This article examines how organisations combined ERP and Internet technologies to enhance performance and improve competitiveness. Specifically the paper will address how Internet technologies and ERP can be harnessed to enhance competitive advantage and identify the barriers preventing organisations from harnessing these technologies?

Four leading companies were interviewed to determine their approach to extended ERP and the barriers encountered? While each of the companies had already taken some steps in this direction they are adopting a cautious approach to the future, preferring to wait and see rather than push their partners towards integration. In short, organisations considering extended ERP should determine the impact on all organisations before proceeding and should also apply the lessons learned from their initial ERP implementation.

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 enterprise applications emerged. These included supply chain integration (e-SCM), business-to-business eProcurement (B2B eProcurement) and customer relationship management (CRM) all of which could be integrated with the organisation's Enterprise Requirements Packages (ERP).

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, V.M; Soni, A and Venkataramanan, M.A. 2001, Van Everdingen, Y; Van Hillegersberg, J and Waarts, E. 2000, Edwards, P; Peters. M and Sharman, G. 2001). As organisations began to improve internal processes through ERP they are beginning to examine how ERP and the Internet could help them improve processes, which extended beyond the enterprise to their customers and suppliers. However, little research attention has been focused on combining ERP and Internet technologies. The primary purpose of this paper is to explore how organisations combined ERP and Internet technologies to enhance performance and improve competitiveness. Specifically the paper will address how Internet technologies and ERP can be harnessed to enhance competitive advantage and identify the barriers preventing organisations from harnessing these technologies?

Review of the Literature and Research Question

Having implemented ERP companies must decide whether they want to take advantage of new technologies and extend their business processes over the Internet. A number of challenges need to be embraced. This literature review highlights the issues facing companies extending their ERP systems to embrace supply chain integration, business-to-business eProcurement and customer relationship management.

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 (e-SCM) requires a trade-off between autonomy and control between each supply partner relationship (Graham and Hardaker, 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. Organisations also need to understand the implications of integration across the entire supply chain (Venkatraman and Henderson, 1998).

e-SCM 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. This requires change across the supply chain – change to management practices, performance metrics and business processes. Two major factors underpin the success of e-SCM (Norris et al, 2001). Firstly, all firms involved must view collaboration as a strategic asset and an operational priority in order to foster trust among trading partners.

Secondly, e-SCM allows information visibility across the supply chain to become a replacement for inventory it must therefore be managed with strict policies, disciplines and monitoring. 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) draws the same conclusion, stating that all steps in the supply chain from design to after sales service must become an integrated flow of information.

Instead of being linear and fixed, the e-supply chain is an enhanced network, a complex but well defined web of relationships with multiple channels and an open flow of information (Koch, 2000). 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.

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

The Internet has allowed a shift towards dynamic communication and improved integration, often ahead of the physical movement of goods. Porter acknowledges the impact of the Internet on the supply chain (Porter, 2001) and asserts that the Internet 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. But 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 companies to use them. This minimises the opportunity for them to deliver competitive advantage.

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 companies within a manufacturing supply chain and, as such, companies are in a position to anticipate demand fluctuations and respond accordingly.

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, 2000).

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 (Scalet, 2001).

Exchange of accurate and up to date information will help organisations share best practices. Relationships can become a competitive advantage built on trust between the partners. Traditionally relationships in supply chains have focused on shaving the supplier's margin, in a collaborative environment organisations will need to optimise the processes for their mutual benefit. Allowing all partners in the supply-chain to dynamically view and 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 their supply chain partners may be few. Many companies believe that their own information gives them a crucial competitive advantage and have no desire to share it freely (Agrawal and Pak, 2001).

Organisations wishing to integrate their supply chains will face many barriers, both internally and externally (Fulcher, 2001). Organisations are already communicating with each other but they 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. Change management will be an issue. People throughout the organisation need to be able to manage the impact of having a faster flow of information.

The discussion so far has focussed 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 Business to Business e-Procurement has on ERP solutions. eProcurement is defined as intercompany trade where the final order is placed online. eProcurement can take place in an eMarketplace 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 (Deloitte, 1999) details many of the reasons organisations are adopting B2B eProcurement and the benefits they are deriving from it. The main benefits

include: transaction cost reduction, self-service, supplier management, plant maintenance integration. 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 eProcurement applications have generally been targeted at indirect goods.

The impact of netmarkets will have a profound effect on eProcurement. 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 marketplace. While online marketplaces are still very much in their infancy, their promise is virtually unlimited. Netmarkets can be vertical, aligned with an industry or have a horizontal focus. However these market places face many difficulties (Pawar and Driva, 2000). Business processes need to be extended across the entire market place, 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. The marketplaces face the classic chicken and egg situation 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 final link that needs to be addressed is the integration of ERP and customer relationship management. ERP systems contain vast amounts of data about and relevant to customers, 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).

Companies 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).

Zefer (2001) highlights many of the high-level benefits. Firstly, companies can control who sees what, when, and why, allowing them to improve customer segmentation, up-sell, and limit or eliminate risk. Secondly, companies 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.

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 Hardaker, 2000). They also see a blurring of the boundaries between the marketplace (physical) and the marketspace (virtual). They contend that the Internet is key in propelling businesses in new directions in both the marketplace and the marketspace and that successful organisations are reaching new levels of integration.

Finally when deciding to replace legacy systems organisations are confronted with 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, a separate production package. The advantage is that the firm should get the system and functionality they want. O'Leary (2000) goes on to list 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 (2002) 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.

In summary organisations can derive value from their ERP implementations through a program of continuous business improvement both within the enterprise and by extending processes to partners. They can build upon their

ERP backbone integrating through eSCM, B2B e-Procurement and CRM. 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.

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 the impact on organisations of extending the capabilities of their ERP systems outside the bounds of the enterprise. This paper attempts to address this gap. The primary purpose of the research is to explore how organisations combined ERP and Internet technologies to enhance performance and improve competitiveness. The underlying research questions are:

- 1) How can Internet technologies and ERP be harnessed to enhance competitive advantage ?
- 2) What are the barriers preventing organisations from harnessing these technologies ?

Methodology

Primary research based on structured in depth interviews was conducted with key respondents involved in the implementation of Extended ERP and who were closely involved in day to day operations. Organisations were selected

from a wide range of industries to indicate the scope of ERP functionality and therefore the potential multiple opportunities for Extended ERP.

Given the nature of the research the researchers felt that in depth interviews based on the views and experiences of key individuals in organisations involved in the implementation of SAP would be most insightful.

Four organisations 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. There are over two hundred SAP customers in Ireland. These include foreign multinationals and large Irish firms that SAP classifies as small and medium enterprises (SME) with a turn over of less than €300 Million. The firms in this SME sector who had implemented SAP in the last four years were felt to be most suitable, as the decision to install SAP would have been made locally unlike many of the foreign multinationals. It was also possible to talk to a single person in these organisations regarding the range of topics in question. All respondents interviewed played key roles in the initial ERP implementation and were involved in the on going direction of IT investments within their organisation.

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 companies and for the media and documentation requirements of hardware 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-including financial services, government, technology, telecommunications, utilities, and healthcare meet their eSecurity challenges.

Findings

These findings address the reasons for ERP implementation, the level and form of the extended scope of ERP and the nature of the interfacing with in-house applications.

While all organisations carried out the implementation of ERP for strategic reasons and are intent on a program of continuous business improvement, the extended scope of its ERP system is limited to a greater or lesser extent. While the organisations alluded to streamlining processes and implementing best practice through ERP, only one organisation claimed that the implementation has actually given them a competitive edge in their market.

Looking at the extended ERP all organisations with one exception have engaged in some form of data exchange with their customers. The exception can be explained by the low volume, high value nature of its business, though like the others it could optimise its financial supply chain. On the other hand, all of the organisations sell their products and services on the Internet and one of the companies has the opportunity to sell its software in download format over the Internet.

With respect to online access, only one organisation provided customers and suppliers with this facility despite the fact that this can be achieved in a very straightforward manner. The companies were aware of the benefits of providing this facility but have not implemented it to date. Indeed, it was

evident that one company could move quickly ahead of its competitors if it did so.

None of the organisations interviewed is involved in eProcurement though two of them expressed some interest in industry marketplaces. The lack of progress in this area may perhaps be accounted for by the relatively low spend in indirect goods for all organisations (in terms of overall spend) and the technical weaknesses of their suppliers.

When interfacing with in-house applications organisations have mixed the 'single vendor' and best of breed approach. One selected SAP's online store because of its simple functionality and full integration. Another rejected this offering because it required more advanced functionality and selected IBM's Websphere product. The other selected Siebel CRM rather than SAP's offering because they believed that SAP did not offer the required functionality.

In summary none of the organisations is taking a proactive approach to extending their supply chain. 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.

Discussion

Supply chain management has enormous potential to benefit from Internet technologies. Organisations no longer have to depend on private carrier networks or dial up connections to exchange data with their partners. At the simplest level a data file can be emailed from an employee's desktop, more complex integration can take place between the ERP systems of partner organisations or with marketplaces. The Internet has moved the supply chain from a horizontal structure to a web of connected organisations.

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. This leads us to the issue of determining who should drive supply chain integration. 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 twelve months. On the other hand C4's concern in this area is that of the dominant player concentrating on dictating the scope and pace of the integration effort. They believe companies particularly suppliers will inevitably be driven by the demands of their larger partners.

If SCM is all about relationships, then trust amongst the parties is paramount to the 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 (2000) has 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. C1 have indicated that they have this problem, for example the 'due dates' of its out of stock items displayed on their web site is incorrect because C1 cannot get their own supplier to give them accurate lead times. While this viewpoint is valid it must be argued that e-SCM is not simply a matter of connecting a series of internal processes across partner organisations, 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.

Despite the evident advantages of the Internet enabled supply chain not everyone is clamouring to take it up. There are a number of reasons for this. Firstly, despite the advances in technology, integrating a supply chain remains a technically complex task. Technical expertise is required by all parties trying to integrate. The cost of such expertise is high whether it is in house or hired for the duration of an integration project. This is reflected in the research by

C4 who find that there is a reluctance on behalf of their customers to become involved in data exchange because they lack the technical expertise, in addition they feel that these initiatives are aimed at larger organisations. Secondly, trust between organisations is imperative if collaboration is to take place, but organisations have a distrust of passing confidential information to customers and suppliers as this may indicate how well they are performing.

It has been argued that e-Procurement is one of the main beneficiaries of introducing an integrated system. 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. Industry analysts have predicted B2B procurement is the real beneficiary of web enablement and that organisations will save vast amounts by further refining their procurement processes by accessing online catalogues. However, in this study there is no evidence that the eProcurement is an important issue for these organisations. 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 organisations feel that their indirect goods are too low value to warrant investment in B2B software. 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.

The arrival of CRM products on the market over the last few years has seen a revision of terminology applied to ERP systems. ERP is now generally designated as the ‘back office’ product dealing with behind the scenes tasks such as finance, production and shipping. CRM products have adopted the ‘front office’ or customer facing position. A variety of products fall under the CRM umbrella, these include sales force automation, Internet sales, call centre management and customer self-service. The purpose of CRM products is to put all the customer contact points together in one place, for example a customer buying a product in a traditional face to face transaction should be able to query that sale on the customer’s web site or call centre.

Interest in CRM products was mixed amongst the companies 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.

For ERP customers the choice of a CRM system presents a strong “best of breed” versus “single vendor” challenge. 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.

Organisations with multiple channels to market can benefit from extending their ERP systems to CRM, however, they must look beyond the current vendor marketing 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.

When extending ERP the "Best of Breed" Vs "Single Vendor" is not as significant an issue as it was for early adopters of ERP. This is due to the advancement of EAI software or middleware and that both groups of vendors are adopting a collaborative approach and are opening their systems for integration. Organisations 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 multiple ways that extended ERP can be achieved to add value to organisations. The options are varied and range from in house activity to interactions with external parties. Organisations can gain competitive advantage from ERP but they must embark on a process of continuous improvement and organisation learning in order to do so. Organisations who do not take this route will be caught by 'competitive convergence' and eventually overtaken by their competitors. This research indicates that there is much interest in extended ERP but it is being approached cautiously. With regard to e-SCM and eProcurement organisations have yet to determine their

precise requirements and whether they will drive the process or be driven by their business partners.

Extended ERP is not simply a matter of adding a new application. Organisations embarking on this route should consider the following challenges. Firstly, business processes whether internal or external must be examined and redesigned as necessary to take advantage of the new technology. Secondly, an effective change management and communications program must be run. Thirdly, the lessons learned from the original ERP implementation should be revisited and ensure that mistakes made then are avoided this time. Finally, a strong business case needs to be developed, with clear objectives and critical success factors.

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