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Integration of an Internet-Driven Supply Chain for a Medium-Size E-commerce Company

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Abstract: *This research aimed at discovering the benefits and challenges of integration across a company's e-supply chain. The research involved a single case study of an Australian e-commerce company. In our work, we first formed a framework of benefits and challenges for e-supply chain integration, which was based on the beliefs held by management consultants. After conducting interviews with various organisational stakeholders of an e-commerce company, we found that although some of the elicited opinions matched those expressed by consultants, others provided their refinement in respect to a medium size, rapidly evolving, start-up company. We also discovered challenges, seemingly ignored by the consultants, which concerned changing market conditions and limited economies of scale perceived as seriously impeding SCM integration. Also, the ability to develop and maintain scalable and effective information systems was found to impact the capacity to integrate services across the e-supply chain. The case study's single most important contribution was to bring to our attention the importance of organisational and environmental maturity in the strategic planning of the supply chain management process.*

Introduction

The traditional view of a supply chain is that of a network of entities through which material flows from suppliers to consumers. Generally, raw materials providers (suppliers) sell to component manufacturers, who sell to final assembly manufacturers, who distribute their products through wholesalers, distributors, dealers, and retailers to the final customers (Kaarma et al., 1999). A primary objective of traditional supply chain management is the minimization of the "total cost of transportation, warehousing, inventory, order processing and information systems" (Warkentin et al., 2000). Traditional supply chains are "push" models, empowered by manufacturers, suppliers and distributors (Kaarma et al., 1999). Usually, companies would utilise various third party providers or transportation services to warehouse and distribute products down the supply chain to wholesalers and other partners.

Traditional supply chains have been designed in a time of modest competition and slow response time and so are mostly outdated for the e-business environment. Hence SCM strategies need to be flexible in order to handle changing supplier priorities and commitments and increased competition (Billington, 2000). Prior to the influx of improved supply chain techniques (e.g. ECR and CPFR) and e-commerce technologies, the very structure of a traditional supply chain attracted a number of inefficiencies. For instance, the communication of demand had to go through many partners before finally reaching the manufacturer. The resulting distortion at each partner led to degradation in the quality of the information needed to manage the supply chain (Lee *et al.,* 1997; Taylor, 2000). As a result, for most products, transportation carriers find it difficult maintaining profitable equipment and driver utilization, the supply chain contains more than twice the inventory required for adequate customer service and products are handled several times too many (Kalakota *et al.,* 1999, pp. 199).

Currently, the trend in supply chain management is directed toward companies integrating their information systems to their suppliers and to their suppliers' suppliers, as well as their downstream partners (Lee *et al.,* 1997). It seems that supply chains are evolving from current enterprise-centric "push" models to more collaborative, partnership-oriented models. In fact, in some cases, e-commerce has allowed companies to interact directly with their customers. This is particularly true in an *Internet driven* supply chain, where companies are less focused on the actual product and more on the individual consumer (Chandrashekar *et al.,* 1999; Kaarma *et al.,* 1999). Thus, unlike a traditional supply chains, the emerging e-supply chains are non-linear and they cover planning, directing, and controlling product flow, services, and information from a firm's suppliers' *suppliers* to its customers' *customers* (Warkentin *et al.,* 2000).

As a result of SCM integration strategies, new supply chain models have emerged, e.g. *integrated made-to-stock*, *continuous replenishment* and *built-to-order* (Kalakota *et al.,* 1999, pp. 217), which eliminate some of the problems in the traditional and the older e-supply supply chains, thus resulting in reduced overheads, improved quality and control of information and product flows, better resource allocations, reduced inventory costs, and more efficient fulfilment. At the same time, however, the emerging e-supply models also bring new challenges for organisations engaging in e-commerce and e-business, e.g. the need for inter-organisation consistency in IT infrastructure, the possibility of cultural or management incompatibilities between collaborating organisations, elevated costs and complexities of implementing an integrated supply chain models, etc. The need for the subtle balance between the benefits and challenges of SCM integration attracted our attention, and hence lead to this research.

Research Method

The question guiding our study was: "What are the Benefits and Challenges of Integration Across the E-supply Chain of a Medium-Size E-commerce Company?" We specifically focussed on the medium-size e-commerce companies, as those organisations are the most representative in the maturing e-commerce market. Our research was conducted during the years 2000 and 2001, however, the bulk of the material was collected before the dot-com crash, and so the study captures the opinions characteristic for organisations operating in a relatively stable market.

As we aimed at obtaining in-depth insights into factors affecting supply chain integration, we thus decided to conduct a single case study. Such case studies normally allow an organization to be investigated in great detail in a short time, thus, enabling to reveal its deep structure (Cavaye, 1996), which could then provide a business context to a range of relevant issues to be instilled within the case (Zikmund, 1997). Due to the limited time and resources, we decided not to use multiple case studies, as they require lengthy or superficial investigations.

Our study included the support and participation of an Australian on-line retailing organisation, which for the purpose of this paper we shall call *Enterest Pty Ltd.* Enterest was founded in 1999 and offered an extensive range of products, to include books, music and videos, games and toys, health and sporting goods, electrical goods, clothing and accessories. Being in the retail business, their supply chain included the management of sourcing, warehousing and delivering products to the customer and between partners in the chain. Enterest also considered SCM integration as a top priority in their approach to optimising their business processes. Enterest's management had extensive logistics, IT infrastructure and supply chain knowledge and experience.

In addition to Enterest, a brief preliminary investigation was carried out with a consulting firm, specialising in systems integration and management. They were interviewed in order to obtain some initial insights into the benefits and challenges of SCM integration in Internet start-ups in Australia and the US. As SCM integration is still an emerging and innovative area, the insight provided by this firm assisted the research by further validating the literature survey in the area.

Face-to-face, semi-structured interviews were then used as the primary source of the case study data (Yin, 1994; Walsham 1995). We interviewed a number of different Enterest staff, which included the Business Manager, CIO, Director of Merchandise and Marketing, Business Analyst, Logistics Director, and the Fulfilment Manager who worked for a major Enterest supplier organisation. Each interview lasted between ¾ hour and 1 hour and covered the general areas of interviewee responsibilities and interests (see Table 1). In addition to interviews, company documents and reports were obtained and analysed as necessary.

The collected data was then analysed qualitatively (Miles & Huberman, 1994, pp. 10-11). All interviews were fully transcribed (Neuman, 2000, pp. 277), validated by the participants and then reduced and transformed (Zikmund, 1997), resulting in the categorisation of collected data and in annotation of transcripts with marginal remarks. Additional tables and narratives were finally used to support the data display for analysis and drawing conclusions (Darke *et al.,* 1998).

Benefits of SCM Integration

In this case study each participant was asked why they believed Enterest would benefit by implementing integrated e-supply chain strategies in their business. Although the responses given were quite diverse, three major classes of benefits clearly emerged, i.e. reduction of costs and increase in efficiency, adoption of more effective management and planning practices, and finally, marked improvement in customer service.

Reduced Costs and Increased Efficiency

In e-business, companies can reduce costs and accelerate order cycles by linking their business processes to those of their partners. In terms of inventory, companies should aim to reduce the lag between placing orders and receiving the inventory level update in order to improve their ability to provide real time inventory (Abbas & Brown, 2000).

Enterest believed there is ample opportunity to reduce costs throughout their e-supply chain, particularly in their major suppliers' warehouse, where many of Enterest-ordered products were picked and packed ready for shipping. Also, by improving efficiencies in their partner's warehouse, Enterest had been able to cut costs substantially. This was necessary for Enterest to remain competitive and for its overall longevity.

Table 1. Issues Discussed with the Enterest Stakeholders

Participant / Issues discussed	Business Manager	CIO	Director of Merchandise & Marketing	Business Analyst	Logistics Director	Fulfilment Manager
Responsibilities	☒	☒	☒	☒	☒	☒
Market Environment	☒	☐	☐	☐	☐	☐
Company Background	☒	☐	☐	☐	☐	☐
Benefits of Integration	☒	☒	☒	☒	☒	☐
IT Capabilities	☐	☒	☐	☒	☐	☒
Partner IT capabilities	☒	☒	☒	☒	☒	☒
E-supply chain Structure	☐	☐	☒	☐	☒	☐
Challenges to Integration	☒	☒	☒	☒	☒	☒
Supplier Relationships	☐	☐	☒	☐	☒	☒
E-supply chain goals	☒	☒	☒	☒	☒	☒
E-supply chain features	☐	☐	☐	☐	☒	☒
E-supply chain mgmt.	☐	☐	☒	☐	☒	☒
Multi-channel Strategy	☒	☐	☒	☐	☐	☐
Order Fulfillment	☒	☐	☐	☐	☒	☒
Duration	**60 mins**	**45 mins**	**50 mins**	**45 mins**	**2 X 45 mins**	**65 mins**

> *"If we can buy products for less, if we can ship them for less, if it costs us less to manage them, then our supply chain is working" (Business Manager).*

As indicated by Director of Merchandise & Marketing, the benefits of an efficient e-supply chain also extended to the customer whilst still allowing Enterest to maintain control over their margins.

At the distribution centre, there were a number of areas Enterest achieved efficiencies, with many other opportunities left for improvement. One of the ways was to change the type of packaging of their products.

> *"In terms of supply chain efficiency that's one area where we've taken significant cost out of our supply chain. One, in the cost of the packaging, and two in the labour attached to doing that" (Logistics Director).*

In addition, Enterest fulfilment could also be greatly improved by automation, as the labour-intensive and inefficient process deployed in the warehouse inhibited the Enterest's e-supply chain scalability. Although a cross-docking system was in use at Enterest, only two of its suppliers were able to effectively support it.

More Effective Management and Planning

An e-supply chain environment encourages the evolution from limited information sharing to rich information sharing (Warkentin *et al.,* 2000). Providing suppliers with performance feedback is one way to improving supply chain partnerships, by offering suppliers a clear indication of their position relative to competition (Abbas & Brown, 2000). Other advantages of real time collaboration and true partnerships include lower levels of inventory, improved cash flows and a substantial reduction of the *Bullwhip* effect (Anderson, 2000). Collaborative planning, forecasting and replenishment (CPFR) aims to improve the relationship a retailer and a manufacturer sharing

forecasts via two-way interactive communication (Walton, 2000). However, intensive collaboration and communication in e-supply chain also needs high flexibility so as to avoid unnecessary dependencies between trading partners, and so they could also effectively deal with changes in market demands, suppliers changing priorities and commitments, customers acting upon their shifting preferences, and competitors turbulence (Billington, 2000; Chandrashekar *et al.*, 1999).

Integration across Enterest's e-supply was recognised to be advantageous by supporting management in their planning and decision-making. It was seen to improve visibility and accessibility of shared data and knowledge, and it aimed to reduce overall inventory levels:

> *"We're a multi-channel business now, but in terms of online e-tailing, there's definitely a need to do that (integrate) to ensure that our inventory levels are as low or accurate as possible. So they're accurate in terms of the projected forecast. In terms of our other channels of distribution they need to be as integrated with our suppliers as possible simply to achieve critical mass and efficiencies in the system" (Logistics Director).*

However, Enterest's lack of further e-supply chain integration had limited the level of information flows with their customers, suppliers and other business partners. The company, however, aimed to improve the visibility among partners and use the customer data to monitor their level of satisfaction. Enterest's SCM planning was also improved by increasing consistency in product availability to facilitate their cross-docking system:

> *"We are providing consistency throughout our supply chain, and part of that involves our cross-docking between Enterest and [partners]. In the past the timing of it was very unreliable" (Logistics Director).*

Enterest also aimed to include suppliers in their SCM planning processes, to improve the overall management of their e-supply chain:

> *"The future sees equal and opposite provision of information so that suppliers are able to do capacity planning, rate of sale, and sourcing of information from our site so that they can be involved in the planning process. Doing so they can see ahead of time that for example if we have a runaway success the suppliers are able to tap into our system for that product and gage a rate of return so that they can plan what our forward estimates are going to be" (Director of Merchandise & Marketing).*

Enterest expended considerable effort to improve their business by focusing on developing warehousing and logistics systems. Enterest believed that their existing cross-docking system was one of the most important steps in that direction.

Improved Customer Service

Customer satisfaction creates more demand, and in turn can increase overall sales and revenue. But it requires extending the range of the available products and an increase in the production rate of in-demand goods (Fisher, 1997). In an e-supply chain, recruiting specialised companies for product variations can extend the product range (Chandrashekar *et al.,* 1999). However, with an extended product range, customer demand becomes almost impossible to predict. Thus, by utilising the *built-to-order* e-supply chain, such uncertainty can be alleviated by offering customers variety and filling orders quickly without the need to stock excess inventory (Fisher, 1997). Also, with the flux of advanced SCM solutions, companies can plan collaboratively with their partners and reduce order cycles, thus, early detection of exceptions in a supply chain network allows correct reaction in *real* time (Anderson, 2000). Including the Internet in the end-to-end supply chain, also allows customers to directly access product information, place orders, track shipments and pay freight bills, thus, making it easier for customers to do business with companies (Kaarma *et al.,* 1999).

In the long-term, it was clear that Enterest aimed to become the 'one stop shop' for customers, thus increasing the range of products and services available to them. Their strategy was to integrate products from suppliers rather than going into direct competition with them. With this

Table 2. Benefits of Integration across Enterest's E-supply Chain

	Participants / Benefits	Business Manager	CIO	Director of Merchandise & Marketing	Business Analyst	Logistics Director
Cost & Efficiency	Company Profits	☐	☐	☒	☐	☐
	Reduced E-Supply Chain Costs	☒	☐	☐	☒	☐
	Reduced Investment & Real Estate	☐	☐	☒	☐	☐
	Improved E-supply Chain Efficiency	☒	☐	☒	☒	☒
	Increased Order Fulfilment Speed	☒	☐	☐	☐	☐
Management & Planning	Better Management & Planning	☐	☒	☐	☐	☒
	Reduced Inventory Levels	☐	☐	☐	☐	☒
	Improved Understanding of Business	☐	☒	☐	☐	☐
	Visibility Across the E-supply Chain	☐	☒	☐	☐	☐
Customer Service	Better Choice and Variety of Products	☐	☐	☐	☒	☐
	Improved Customer Service	☒	☐	☒	☒	☒

model, Enterest believed that suppliers and manufacturers would have the opportunity to leverage off their e-commerce expertise and position in the market space by providing a virtual store that acts as a 'shop' for their products:

> *"Enterest focuses on the supply chain as a means to an end. The means to an end is satisfying the customer requirement, so it's the customer in the first place that tells us what they want. What Enterest needs to do is meet those customers needs, and managing it on the supply chain is part of managing the customer need" (Director of Merchandise & Marketing).*

However, in the short term it was important for Enterest to be up to date with innovative technologies in order to facilitate a one-on-one relationship with customers, and to assess their current customer service performance, and compare and contrast it to their competition.

> *"The real success for a lot of retailing will be to manage a one-on-one relationship with customers. Having the technology capable of managing what might be half a million customers, knowing that a particular customer is interacting with us at any particular time, and they have these peculiar needs. Using the technology to manage that is where true CRM customer relationship management will start to add value both to the customer and to Enterest" (Director of Merchandise & Marketing).*

Finally, by providing visibility and information feedback to the customer service centre, Enterest have gained better understanding of the reasons why their warehouse was contacted. Enterest used this information to anticipate warehouse requests and, as a result, improved their overall customer service levels.

Summary of Enterest E-Supply Chain Integration Benefits

Our study confirmed the three major areas of benefit recognised by other researchers in e-supply chain integration, i.e. reduction of cost and increase of efficiency, better management and planning processes, and improvement in customer services (in both B2C and B2B models). Table 2 lists these benefits (in rows) and attributes them (by cross) to statements made by different study participants (in columns).

Other, less reported, benefits of SCM integration at Enterest varied depending on the participant (refer to Table 2). The CIO believed integration would improve visibility allowing Enterest a better understanding of their business. The Director of Merchandise & Marketing claimed that a well-integrated e-supply would increase profits and allow Enterest the ability to reduce their overall investment in SCM. The Business Manager believed that integration would speed up the order fulfilment process, from the store web site through to its warehouse. The Logistics Director thought that further integration would improve their warehousing processes, including collaboration with suppliers by lowering overall inventory levels.

Challenges of SCM Integration

Management consultants in e-supply chain integration, such as those involved in our study, identify three main classes of challenges facing mature e-businesses, i.e. challenges due to incompatible culture of collaborating organisations, due to inadequacy of human and financial resources allocated for the e-supply ventures, or due to difficulties in maintaining continuous improvement in integration and collaboration. Less experienced, start-up or rapidly changing organisations face many more challenges, some of which we identified in Enterest and which we classified into three major categories, i.e. business, infrastructure and external challenges.

Business Challenges

For the effective SCM in e-business, participating organizations need to adopt an appropriate business model and culture, which could facilitate inter-organisational integration, sharing of skills and knowledge, and enable change in response to market forces (Parr *et al.,* 1999). This could be achieved by good management practices, such as selective staffing, process measurement, motivation and self-management (Zhang & Zhang, 1995). Organisational and personal role boundaries need to be clearly defined, and leadership and accountability set as priority in organisational context (Abbas & Brown 2000). At the same time, collaboration between partners and within their organisations is paramount for companies aiming to fulfil their strategic SCM goals in their e-supply partnerships (Chandrashekar *et al.,* 1999; Lambert *et al.,* 1999).

These were in fact the main challenges for Enterest. Since its inception, Enterest suffered from a lack of process integration with their partners, particularly their suppliers. Enterest believed that further integration with all partners would benefit customers by improving visibility of information in order to meet customer expectations:

> *"The challenge at the front end, before the order, is to have relationships with suppliers over time using as much electronic technology as possible to be able to source product availability in real time, to meet the customers requirements" (Director of Merchandise & Marketing).*

In addition to suppliers, Enterest have experienced some difficulties integrating with their warehousing partners. These problems involved integrating Enterest's web site ordering system with the order fulfilment system using EDI, which was shown to be sub-optimal for the internet-driven e-commerce supply chain.

Parts of the inter-organisational network in the Enterest's e-supply chain was created due to the company's deficiency in some of its core competencies, e.g. the lack of knowledge in end-to-end planning in warehousing and logistics. This resulted in a decision to outsource order fulfilment to a third party provider. The other reason was a faster time-to-market for their rapid product rollout strategy. The CIO explains Enterest's decision to outsource:

> *"Well we didn't have the core competency in picking and packing. And we didn't have the warehouse facilities. We identified we needed to be able to handle a lot more in terms of throughput, and a lot faster than we were simply capable of building the infrastructure to supply. So we had to find it somewhere" (Chief Information Officer).*

It was also clear that Enterest SCM skills were lacking on the supplier's end as well. As a result, Enterest were faced with the challenge of understanding and proposing the best way to integrate with all their suppliers. This was achieved by standardising their software and allowing the suppliers to easily connect into their IT systems. Such an approach was to improve not only their data communication facilities but also improve their business processes and facilitate collaboration between partners:

> *"We're like a central pond with lots of little fish (small suppliers) that we have to deal with. So we should deal with them all in the same way, and standardise our communication. This may include the way they bill us, the way we give them money and the way they send products. If all that fits in nicely then it's a lot more efficient for us" (Business Manager).*

Standardising the collaboration between Enterest and all their suppliers was extremely challenging. Although Enterest's partnership increased their time-to-market, it also increased overall complexities by requiring increased management of their overall e-supply chain. These complexities added further pressures to Enterest as they continued to introduce new products and departments in their business whilst trying to improve relationships with their existing suppliers.

Managing Enterest and championing the company's e-supply chain strategies was another of its serious business challenges. Although Enterest had an entire team of people accountable for facilitating integration and performance measurement, some of its members, however, felt that due to market pressures challenging Enterest daily, forward planning for further integration with their suppliers was not as critical as day-to-day operations.

> *"We are, I mean we are looking at monitoring our suppliers and determining how we can achieve better service from them and how we can integrate further into their business…But I mean what you're talking about now is forward planning. It's not until our business becomes a mature business that we will be able to look at those opportunities. At the moment we don't have the luxury of time to look at those opportunities but in retrospect we probably should" (Logistics Director).*

To counter-balance this not so uncommon opinion, CIO firmly asserted on another occasion that future planning was fundamental to the company business. One of those fundamental issues was to establish trust between Enterest and its suppliers. As part of trust building, Enterest devised some benchmarks and established service levels that were agreed upon by all parties. Having done that, Enterest actually struggled to measure and meet those service levels to the suppliers' satisfaction. On the other hand, many Enterest's suppliers and partners were also unable to deliver their services as promised. Hence, this lack of trust and communication posed a significant barrier to Enterest's ability to further integrate across their e-supply chain.

Constant struggle with the limited capital and large warehousing and delivery costs are common in today's e-business, which includes Enterest. By descending down the Internet boom, the company had to re-evaluate their approach to e-commerce by sharply focusing on cost cutting, which meant holding more of their major selling lines and decreasing their entire product range, thus undercutting any other concerns, which also included the sophistication in the e-supply chain:

> *"We've got limited capital, so we've got to budget everything up. We've got to spend X amount on IT and X amount on logistics and distribution, and X amount of money to buy certain things, so we have to prioritise what we buy. So at the moment its more important for us to get a stable website, and a great product offering, and we want to make it easy for customers to buy online, rather than the worrying about the biggest supply chain issues which at the moment won't have much impact because the scale is not there" (Business Manager).*

Yet the Logistics Director felt that Enterest were not sufficiently focussed on SCM integration as opposed to other parts of the business like merchandise and marketing. Not surprisingly, Enterest staff in general believed that one of their biggest problems lies in disparate systems and disparate interfaces, and the enormous complexities involved with integration of inter-company systems.

Infrastructure Challenges

One of the major symptoms of a lack of SCM integration is the 'bullwhip' effect (Lee *et al.,* 1997), which we consider a major fault in the inter-organisational infrastructure, rather than a common business challenge. There are two major causes of the bullwhip effect, i.e. long resupply lead times and multiple demand-forecast updates, with common symptoms of excessive inventory, poor product forecasts or poor customer service due to unavailable products. In e-commerce, this effect is amplified even further as demand variability is much higher (Fisher, 1997). Lee *et al.* (1997) suggest information sharing, channel alignment and operational efficiency as possible remedies for bullwhip effect, and the new SCM initiatives such as ECR, VMI and the direct built-to-order e-supply chain (all previously mentioned) have been introduced specifically to reduce the effect.

Enterest staff understood that integration reduces the negative effects associated with sub-par management of their e-supply chain. They realized its importance because there are fundamental differences between their business and the traditional retailer.

> *"The thing we have different from traditional retailers is that when a traditional retailer is out of stock, the customer doesn't see the product and therefore doesn't know whether they want to buy it. With online retail, when we have that product on our site, whether or not we've got the product in stock the consumer can expect to buy that product. So we require the ability to manage 'out of stock' product, and in a more time effective manner than a traditional retailer, who doesn't actually know they're losing a sale" (Director of Merchandise & Marketing).*

In order to increase the accuracy of Enterest stock estimates and to improve product visibility in the supply chain, the company Business Analyst was particularly concerned with the technological solutions to support obtaining and manipulating real-time data correctly, e.g. with EDI or XML. Another Enterest's plan to address these challenges was to implement a new ERP system into their business that would improve integration among business units and between partners. Unfortunately, many of the Enterest's suppliers lacked the technological infrastructure to support high-tech real time visibility and delivery. As a result Enterest were forced to negotiate with their suppliers to upgrade their own IT infrastructure.

External Challenges

In the course of our study, we were amazed to discover the whole group of challenges, neglected by the consultants in e-supply chain integration, especially those we talked to. The class of challenges that we identified were deeply rooted in various strategic factors, which we determined as external to the organisations in the supply chain, e.g. market forces, economies of scale and maturity, the issues of market growth as compared with the scalability of the available technology. It wasn't surprising, however, that it was the Enterest's higher management, who were particularly concerned with these strategic issues.

The constantly changing nature of the marketplace creates a challenge for Enterest in deciding what hardware and software investments to make. In terms of SCM applications the CIO believed this area was still in its "juvenile" phase:

> *"We use some 3rd party services for particular marketing related services. We can utilise those sorts of services provided by an external ASP. Actually most of those facilities are available at the marketing level but not at the supply chain level or the logistics level. The logistics levels are still maturing in the market" (CIO).*

In particular, Enterest needed to constantly seek the best solution for their web site infrastructure.

Enterest had also been challenged with the limited economies of scale, and as a result, needed to remain highly flexible to changing customer requirements. This included their decision to acquire the services of four independent transport providers, to facilitate deliveries to different customers in different locations. Enterest viewed electronic marketplace as very unstable and, as the Director of Merchandise & Marketing explained, until Enterest's scale approached its critical

mass, they would be limited in terms of their margin capability and their ability to effectively integrate with suppliers:

> *"Because we're in start up mode and are just growing with the economies we are precluded from taking for example, Asian sourced product, where margin capability is a lot easier because you have to buy and contain a lot. We don't want to be in that business yet because that means we are making a long-term prediction that what our buyers choose is what our customers want" (Director of Merchandise & Marketing).*

Consequently, in the short term Enterest were limited to using a form of wholesale aggregation on site in Australia, to acquire their products. This presented Enterest with a real challenge until they were able to improve their economies of scale to acquaint some of the traditional bricks and mortar, large size retailers. For example, many suppliers including traditional businesses have been reluctant dealing with Enterest directly because they only accounted for a small proportion of their business. Enterest, however, strongly believed that their situation could improve over time, which would be dependent on Enterest's ability to drive further sales and revenue to their business, as well as, having the e-supply chain infrastructure that would enable them to become *"one of the largest movers of these external products"* (Business Analyst).

In order to maintain scalable systems that were flexible to variability in demand, Enterest had to scale up in their own information technology, which included hardware and software systems. They had to provide additional facilities for order handling, in order to deal with sudden drops and rises of order volumes. Depending on the relative urgencies, in some cases Enterest's approach had been to immerse more people in the problem area. However, the CIO believed that issues of scalability and growth are industry-wide and cannot be dealt with properly without strong prior understanding of the e-commerce industry as a whole, which requires more research in the area.

Discussion and Conclusions

Having completed our study of a single e-commerce company, we gained a number of insights into the benefits and challenges of e-supply chain integration in a medium-size e-retail company.

Surprisingly, previously identified benefits of SCM integration were more perceived than actual. Some of these benefits included faster order fulfilment, inventory reductions and improved supplier partnerships. Though Enterest's actual benefits were also substantial, e.g. improved customer service and a reduction in costs through improved e-supply chain efficiencies. At the time of the study, Enterest were still to gain the main benefits of SCM integration, e.g. the long-term competitive advantage through increased revenue growth. Interestingly, the challenge of dot-com crash proved very sobering for Enterest, and so and after a series of downfalls and recoveries, the company reduced its alliances, staff, services and products.

Table 3 lists challenges observed to face Enterest (in rows) and attributed (with crosses) to the study participants (in columns). We classified these challenges into three generic categories related to business, infrastructure and external factors (the latter seemingly elusive to management consultants, see the shaded area in Table 3). Some of these challenges prevented Enterest from further SCM integration; others impacted the actual process of integration. To our surprise, many challenges showed clear inter-dependencies between internal and external factors, e.g.

1. As Enterest were in a constant state of flux growing rapidly from a small to a medium size e-commerce company (internal), they lacked organisational and financial capacity to stabilise changing market conditions and to react flexibly to external pressures (external);
2. Being an immature start-up business (internal), Enterest faced difficulties in utilising economies of scale, gaining organisations' trust to form alliances, and developing the necessary communication channels to integrate with its business partners (external);
3. As Enterest operated in quite immature technological environment (external), Enterest and its partners' information systems lacked the necessary scalability and complexity (internal) to effectively respond to continuous market growth and variability.

Table 3. Challenges of Integration across Enterest's E-supply Chain

	Participants / Challenges	Business Manager	CIO	Director of Merchandise & Marketing	Business Analyst	Logistics Director	Fulfilment Manager
Business Challenges	Lack of process integration across partners	☐	☒	☒	☒	☐	☐
	Lack of knowledge & skills in logistics and SCM	☒	☒	☐	☐	☒	☐
	Achieving effective vision and leadership	☐	☒	☒	☐	☒	☐
	Establishing trust and open communication	☐	☐	☒	☐	☒	☒
	Cost & complexity of integrated e-supply chain	☒	☒	☒	☐	☒	☐
Infrastruct. Challenges	Inconsistent or out-of-date data - the bullwhip effect	☐	☐	☒	☒	☐	☐
	Lack of infrastructure or resources for collaboration	☐	☐	☒	☒	☐	☒
External Challenges	Changing market conditions	☒	☒	☐	☐	☐	☐
	Limited Scale & Maturity in B2C E-commerce	☐	☐	☒	☒	☐	☒
	Capability in maintaining scalable & effective IS	☐	☒	☐	☒	☐	☐

By looking at these dependencies, it was evident to us that many of the Enterest's supply chain integration barriers could be significantly reduced by forward planning for change in organisational and environmental maturity.

Managing change has been previously noted as essential in effective supply chain strategy (Easton, *et al.*,1998). It has also been acknowledged as important to manage the continuing evolution of supply chain capabilities (Kalakota & Robinson, 2001, pp 292-295) and the gradual improvement in the supply chain processes (Fawcett & Magnan, 2001, pp 44, 49). The impact of organisational and environmental maturity on the supply chain management process, as brought to our attention through this case study however, is still to be widely recognised as significant in the supply chain strategic planning and yet to be considered as an integral part of the accepted supply chain integration models (Bowersox et al., 2002, pp 174-179; Supply-Chain Council, 2002).

In our future work, we hope to further explore the issue of organisational and environmental maturity in supply chain strategic planning and to follow up the case study reported in this paper with a multiple case study, which would allow us cross-organisational analysis of various internal and external factors affecting organisations' ability to deal effectively with change.

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