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Title	Applying the concepts of extended products and extended enterprises to support the activities of dynamic supply networks in the agri-food industry
Author(s)	Wall, Brian
Publication Date	2005
Publication Information	Hunt, I., Wall, B., & Jadgev, H. (2005). Applying the concepts of extended products and extended enterprises to support the activities of dynamic supply networks in the agri-food industry. <i>Journal of Food Engineering</i> , 70(3), 393-402.
Publisher	Elsevier
Link to publisher's version	http://www.sciencedirect.com/science/article/B6T8J-4G24X71-1/2/95a6c7206784406bf67ee83858c7a662
Item record	http://hdl.handle.net/10379/433
DOI	http://dx.doi.org/doi:10.1016/j.jfoodeng.2004.06.031

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Applying the concepts of extended products and extended enterprises to support the activities of dynamic supply networks in the agri-food industry

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Abstract

During the last decade industry focus has been on the development and integration of processes in the context of the food supply chain. As a result, the food supply chain can be considered highly integrated where information technology streamlines the use of data and information. Presently the focus is shifting to the supply chain that sits in front of the food industry; the animal feed supply chain. The idea is to integrate all the processes within this supply chain and to connect the two supply chains (food and feed) in such a way that processes that cross-boundaries are completely integrated. In response to this, business strategies must now focus not only on traditional economical and technological interests, but also on topical issues such as safety of food and animal feed products, environmentally friendly production and still provide consumers with safe, quality and inexpensive food.

This paper introduces the agri-food industry concentrating specifically on the animal feed and food industries. It presents the business processes, strategies, and activities in supply chain management that are acting as an antecedent factor in the adoption and participation of eBusiness. The paper will also introduce eBusiness models for these industries and the implication of these models is that over time, the organisation will learn more about the external and internal environments in which its supply chain operates its own and its partners business, and the key functional areas associated with their business. As a result, the organisation will focus more on their business and eBusiness strategies and co-operate with its partners in identifying areas, which need improving across their supply chain.

Keywords: eBusiness; Supply chain management (SCM); Roadmap; Dynamic supply network

1. Introduction

According to Thoben, Eschenbacher, and Jagdev (2003) to compete in the competitive global marketplace, manufacturers and suppliers have to come up

with novel ways of forming alliances to sell their products. The extended and virtual enterprise concepts have been acknowledged as important paradigms in the modern business environment. Additionally the opportunities to produce products in a collaborative way have become a key issue for supply chain partners. The concept of extended product, packaging core products with additional services to make the overall package more attractive to the prospective customer is now becoming an issue for managers and researchers alike. Consequently the successful application of eBusiness

has become an important business objective for organisations. Enterprises want to co-ordinate their activities effectively with those of their business partners, streamline operations, increase their profit margins and enhance their customer service. With a combination of eBusiness initiatives and supply chain management strategies, organisations expectations and ways of doing business are radically changing. The key issue for many organisations is how to respond to these changes in an effective manner. This paper discusses key issues in supply chain management and eBusiness within the animal feed and food industries and it presents a number of case studies, which considers the concepts of extended products and extended enterprises. These concepts are used to support the supply chain and eBusiness activities across the supply chain activities of these industries.

2. The agri-food sector

2.1. The animal feed industry

In Europe, the animal feed industry market has increased dramatically over the last thirty years. It has also beginning to contribute to the improvement of the consumer food supply, in terms of quantity, diversity and quality. However, the animal feed industry is one of the last industries to embrace the eBusiness revolution. Owing to the various technological and cultural aspects of the industry and the structure of the animal feed supply chain this industry has been slow to embrace eBusiness. Farmers traditionally have had little or no access and experience in using information technology. Nevertheless this is beginning to change with *Forbes* magazine estimating that up to 50% of farmers in America have now access to the Internet and these farmers are beginning to see the usefulness of information technology and the potential earnings that can be gained from using it (*Forbes*, 2000).

The feed industry is ideally qualified to benefit from eBusiness strategies. It is a large industry with unique information and logistic demands, driven by a diversity of producers and customers, fragmented markets and many unique products. Feed producers and their major raw material suppliers have recognised the need to become eBusiness focused resulting in a multitude of web sites and agricultural “dot com” companies being set up to satisfy their business needs. These companies now have web sites and marketplaces, which feed supply chains can utilise. Some web sites provide farmers who grow crops for supply to feed producers, with a platform on which they can sell their crops and carry out other transactions. They also offer the farmer additional services, which increase the farmers loyalty and help to foster the feed industry community. These sites can also provide the farmer with expert advice and analysis from

crop specialists, access to crop manuals and agricultural articles, fora or discussion groups for information exchange amongst their peers, reviews on new seed technologies, weather forecasts and pest notifications. The sites can offer feed producers a way of purchasing grains and other raw materials, organising their transport and acquiring accurate market information from both their supply and their customer sides.

The emerging new technologies, although still scarce in this industry must be introduced. Introducing supply chain initiatives and eBusiness strategies will succeed in giving this industry the tools to carry out successful business transactions on line as well as offering a range of services to the various players in the chain.

The food sector has been slow to adopt new business technologies. Larger food companies with greater financial and human resources are more inclined to apply new eBusiness technologies however, the level of technology take-up in smaller companies is low. Small to Medium sized Enterprises (SMEs) in this sector tend to rely on traditional communication techniques and on relationships that they have built up over many years (*European-Commission*, 2002).

The food industry environment had a complete “face lift” beginning in the late 1970s and early 1980s with changes in technology, thus leading to increased concentration on managing the retailer and supplier chain. Efficient consumer response (ECR), vendor managed inventory (VMI), collaborative forecasting and replenishment (CFAR), have become well established business practices which have been adopted by some of the major retail and manufacturing companies. They are already benefiting from reduced costs across the supply chain and increased market growth and market share (*Hunt, Oliveira, Caskey, Jackson, & Marshall*, 1998). The use of technology in supply chain management offers significant potential. The smaller food industries can create a competitive advantage by adopting a strategic perspective. Further technology such as the Internet, Intranets, World Wide Web, Extranets and mobile technology are enabling the food industry to achieve strategic advantages in reducing costs across the supply chain, and allowing partners to collaborate and communicate effectively.

With the successful implementation of these emerging technologies the environment in which organisations conduct their future business will change enormously. The food supply chain is in a state of transition, in which previous “best practice” conditions are changing. Market pressures and technology enabling paradigms are pushing the businesses towards new frontiers, where new organisation models are emerging. Within the food sector there is an increasing demand for solutions which migrate from, supply-driven to customer-driven processes. The supply-driven tradition is based on the availability of goods, where the customer-based model is driven by demand.

Many of these processes fall under the umbrella of ECR. However, there is a barrier to entry for the SME, namely investing in the extensive information system necessary to establish the required information flows to service these functions. Until recently food supply chains were dominated by a single big player, usually the manufacturer or retailer. They decided on the products, the packaging, and the delivery quantities and controlled the market by their aggressive advertising and marketing campaigns. They invested heavily in distribution and squeezed out the wholesaler or middleman. Large food retail outlets set up their own distribution to control their margins and stocks and took control of the advertising and marketing of products.

The early nineties saw an increasing demand for quality products and a pleasant shopping environment. As well as having to ensure quality by paying more attention to the source of their product, the delivery time scales and shelf life, retailers also had to invest heavily in enhancing and expanding their retail outlets and relinquishing their ambitions to control distribution and warehousing. Distribution and transportation had to be outsourced, leading to permanent optimisation negotiations and clear mechanisms supported by transparent information to monitor them. These moves coincided with another factor namely a change in the whole issue of company ownership. The real competitive advantage now is to maximise profit whilst minimising ownership. Large corporations have divested themselves of many of the ancillary operations, which they once

considered essential to their business. This spinning off has allowed many of their offshoots to become independent small businesses. This means that there are now more SMEs involved in any single supply chain.

2.2. The complete food chain

In order to obtain the desired need for integration between the animal feed industry and the food industry it is necessary to develop close links throughout both chains. Developing efficient linkages between the various nodes of the supply chains has occurred as a result of serious problems in the feed supply chain with respect to integration and information transfer. For example in 1999 a loss assessor's investigation into unusually high death rates in hatching chickens led to a widespread ban on Belgian chicken and egg products. After investigating this, Belgian authorities revealed that dioxins may have contaminated animal feed distributed to chicken and egg producers. As a result of this inquiry and the breakdown in information across the chain, the European Commission (EC) imposed a ban on animal feed and raw material distribution among EC member countries. Now other players in the feed supply chain realise that integration between the food and animal feed industry is important. Also as a result of bovine spongiform encephalopathy (BSE) and Foot and Mouth disease many consumers are anxious to know that the food they eat is safe. Fig. 1 illustrates at a high level the flow of material and information from the feed

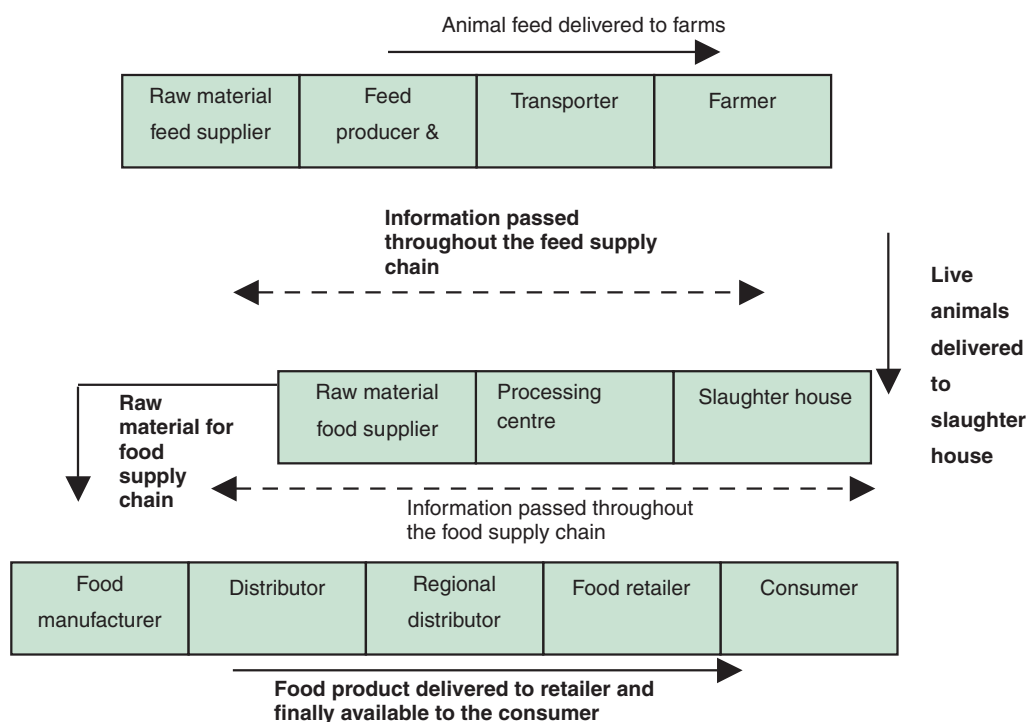


Fig. 1. Animal feed and food supply chain.

supply chain to the food supply chain. At a lower level there are many other links to the chain. For example in terms of the feed supply chain other links in the chain include formulators, veterinarians, nutritionists and transporters. In the food supply chain links include transport companies and regulatory authorities.

3. Key challenges in managing supply networks in the agri-food sector

Almost without exception key industries are restructuring their supply chain networks in a bid to meet global trends and continue to meet customer demands. In the case of the food and feed industries the future will be to work for the optimal supply chain structure. The hope is that this one structure can be applied to all supply chains in business-to-business markets (Lancioni, 2000). Reutterer and Kotzab (2000) reject the idea that there can be an overall valid best practice solution for the design of the supply chain. They point out that the design of a supply chain is dependant upon the economic, market and competitive conditions that exist in the market place (Christopher, 1999). However whatever viewpoint one takes there is no doubt that supply chain networks are confronting new challenges. These challenges include (Lancioni, 2000; Strader, Lin, & Shaw, 1999):

- More instances of multi-site manufacturing.
- Increasingly cut-throat marketing channels.
- The maturation of the world economy.
- Heightened demand for local products.
- Competitive pressures to provide exceptional customer service.
- Quick, reliable delivery.
- Commonality of turbulence and volatility in markets.
- Time-to-market for new products.

Supply chains will have to become less complex (Lancioni, 2000). As Christopher (1999) points out, the companies with agile supply chains "...are the organisations that will be best equipped for survival in the uncertain markets of the twenty first century". Operating an integrated supply chain requires continuous information flows, which in turn help to create the best product flows (Lambert & Cooper, 2000). The customer remains the primary focus of the process. Achieving a good customer-focused system requires processing information both accurately and in a timely manner for quick response systems that require frequent changes in response to fluctuations in customer demand. Critical to effective SCM is the controlling uncertainty in customer demand, manufacturing processes and supplier performance (Lambert & Cooper, 2000) and also according to (Billington, 1994) balancing reliable cus-

tomers delivery with manufacturing and inventory management costs.

Ferrer and Findlay (2003) in their paper on "European Supply Chain Management Characteristics and Challenges" believe that supply chains are undergoing unprecedented change. They believe that European consumer and business markets are depressed, reflecting both a fall-off in economic activity worldwide and unresolved structural problems at the European Union (EU) and constituent national levels. Despite this comparatively gloomy outlook, an accelerating pace of change is a hidden but common characteristic of European supply chains. Driving that acceleration is a combination of structural change, arising from the continuing impact of the single currency and the forthcoming expansion of the EU, the impact of new technologies, and, arguably most significant, a renewed focus on practical supply chain issues in response to tighter market conditions.

The supply chain networks for the food and feed industry are reacting both to global trends and to the changes brought about by the continued expansion and ever-deeper integration of the European Union. Ferrer and Findlay (2003) hold the opinion that the drive to unity is strong, but the diversity of competitive practices, labour laws, and regulations across Europe's different countries and regions is rich. Therefore, while European supply chain executives are confronted by the same challenges as their colleagues in other developed markets, they also face challenges that are specific to Europe, including how to develop pan-European cross-border distribution and manufacturing, how to achieve continental intermodal arrangements, and how to plan for virtual supply chains while coping with widely differing degrees of IT development and a plethora of legacy systems.

The supply chain winners will be those who can continue to create new opportunities through the implementation of optimised networks and the development of collaborative partnerships across their extended enterprises. A suggested solution to meet the key challenges facing the food and feed industries is using eBusiness models of extended products and extended enterprises (EE).

4. Proposed solutions to the key challenges: using the new eBusiness models of extended products and extended enterprises

Recent developments in information and communication technologies have led to the evolution of business models that would not have been possible in the past. Timmers (1999) defines the business model as providing an architecture for product, service and information flows where the sources of revenue are described and the benefits to the various business actors are clear.

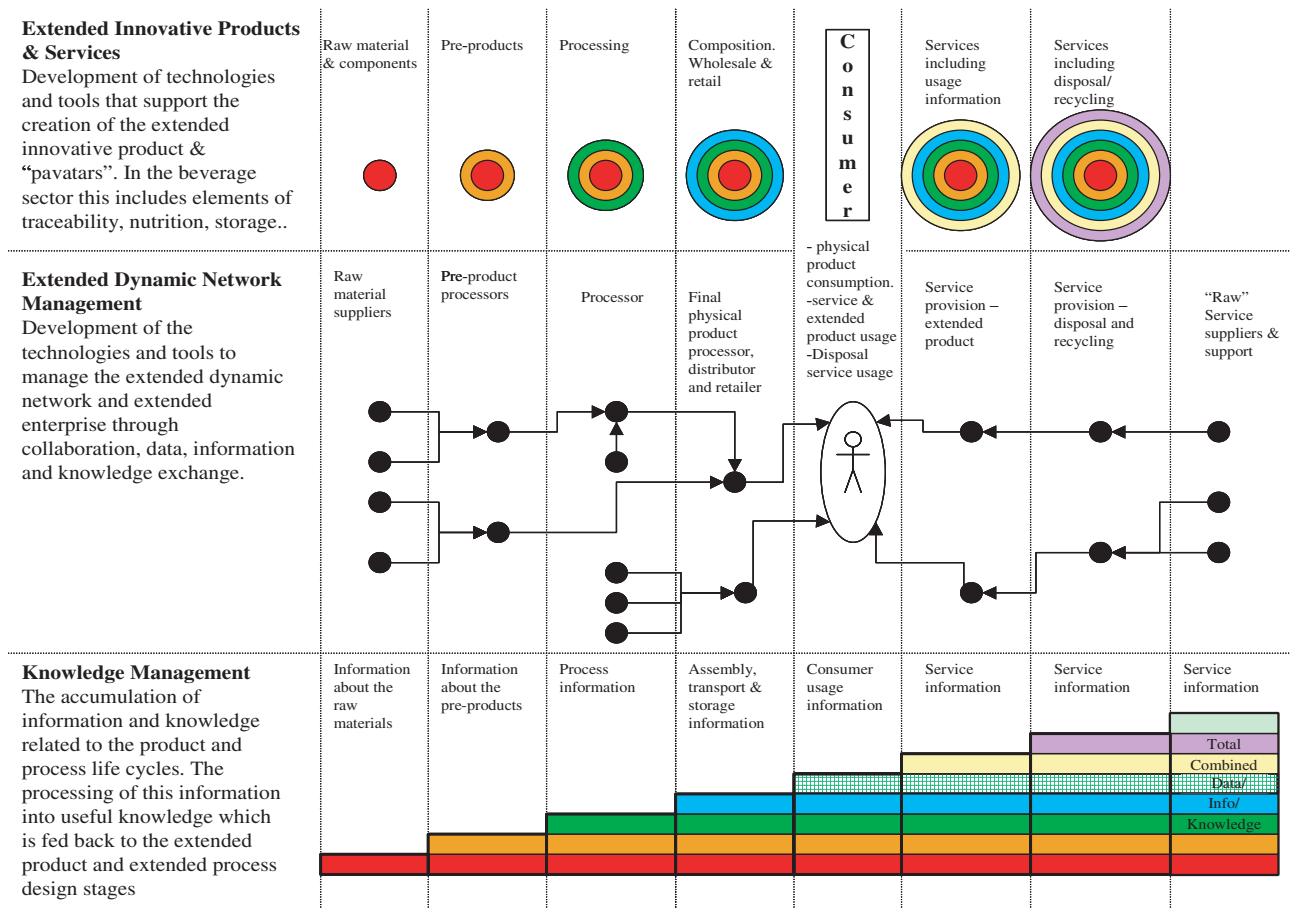


Fig. 2. Combining the emerging eBusiness models for the agri-food industry (Wall, 2004).

Rappa (2003) defines a business model as being the method by which a company can sustain itself through revenue generation. He maintains that it should spell out the way in which a company makes money by specifying where it is in the supply chain. In the past few years, a number of new business models have emerged which could not have been imagined prior to the recent digital technology developments. For example, Dell computers have adopted a highly successful “direct model” (Rappa, 2003), which allows a manufacturer to sell their products directly to the end customers thus by-passing the usual supply-chain intermediaries. Dell applied this model, using the principles of just-in-time delivery of mass-customised products with zero inventories, but also based on underlying Internet technology. Ford and GM are pursuing a similar model in the automotive industry. Amazon (www.amazon.com) has adopted a “merchant model” (Rappa, 2003) allowing them to retail goods and services over the Internet. These eBusiness models have only come about because of the advances that have been made in technology and the willingness of value chain players to adopt these technologies. Recent and ongoing research studies carried out by the authors have revealed the potential

emergence of a number of interrelated business models in the beverage sector. These models depicted in Fig. 2 are (a) the extended innovative product supported by (b) the extended dynamic network and based on (c) the ability to manage knowledge in an innovative way.

5. Extended innovative products and services

This model supports the creation of the extended product and product avatar. The product avatar or “pavatar” can be defined as an intelligent piece of “memory” that is attached to a physical product or service that, for example, learns how it was managed, planned, repaired, used, stored or transported. It collects all data and information along the product life cycle and has the potential, eventually, to become “smart” and make some decisions for itself. The model is concerned with products and services and the accumulation of information and knowledge associated with these entities. The product itself may contain the information, through the pavatar concept or it may be stored centrally using some existing portal type technology.

5.1. *Extended dynamic network*

The extended dynamic network is a concept that evolves from the notion of many supply chains interacting together in an environment that is supported by information and communication technologies (ICT). The ICT element facilitates the interaction of the previously discreet supply chains creating the extended network. It also enables the relationships between the entities to change, thus allowing a dynamism that would not have been possible in the past and giving rise to concept of extended dynamic network. This model aims at addressing the management of the dynamic network of extended enterprises through collaboration & data, information and knowledge sharing and exchange. From Fig. 2 it is clear how closely this relates to the extended product concept. The information collected at the various nodes in the dynamic network combines to create a “history” of the product—from the first raw material purchase to the consumption and use by the consumer and its final disposal, reuse or recycling. This is more than traceability. The information that is collected facilitates two key objectives:

- The management of the network by the enterprises that make up the network. The information is used to control, co-ordinate and eventually synchronise the efforts of the network enabling them to create a product cheaper, faster and of higher quality.
- The accumulation of information and knowledge about the product and service that adds value to the product or service itself. This gives a direct advantage to the consumer who can use this knowledge to improve their standard of living, quality of life and health.

There is symmetry between the life-cycle stages of “physical product” and the less tangible “service”. The physical product goes through the stages of raw material, processing, distribution and retail before reaching the citizen. Similarly the enterprises that provide services directly to the citizen rely on other “raw” service providers. In the beverage sector, for example, the citizens’ empty bottles are collected by a disposal service provider who in turn uses the services of the glass recycler.

Each enterprise involved in the network has information to provide. This leads to a huge increase in the amount of available data and information and this needs to be managed in a way that allows useful knowledge to emerge.

5.2. *Knowledge management for innovation*

The objective of this model to provide a means of managing knowledge for process and product innovation in the agri-food sector. This involves developing

new ways to organise innovation process, by supporting the collection of ideas and relevant knowledge through the extended enterprise, for new and existing process and product developments. These ideas and knowledge are developed into a means of managing and fostering innovation, achieved by combining ideas and feedback from all the phases of the extended product life cycle. The large amount of data and information produced by the extended dynamic network needs to be managed in a way that fulfils the following objectives. It should:

- Adhere to standards and ontologies of the agri-food sector.
- Enable the collection of expertise from all the parties involved in the extended product’s life cycle.
- Foster product and process innovation in the extended enterprise.
- Facilitate the extended enterprise to better manage their supply and demand network.
- Allow the consumer to make informed decisions quickly regarding what they consume and give them the opportunity to make the best/most suitable use of their purchases.

6. *Case studies*

Research has shown that for many organisations it is not clear how they can improve their supply chain performance and what tools, techniques or strategies they should implement to support the activities of their supply chain networks. A number of case studies have been identified to highlight how the concepts of extended products and extended enterprises are been applied to support the activities of supply chain networks.

6.1. *Extended enterprise*

The rapid growth in computing technology and the advent of the Internet have made possible a greater grade of connectivity between supply chain partners giving rise to the concept of the extended enterprise. For many companies the Internet provides a global link to the company’s customers and suppliers (Collett, 1999; Kalakota & Whinston, 1997; Lau, Chin, Pun, & Ning, 2000; Mills, 1998). The extended enterprise allows a firm to take advantage of external competencies and resources without owning them (McMahon & Browne, 1998). Cherry Tree and Co. (2000) identifies the extended enterprise as a business whose information system operates within a distributed application architecture. The architecture is arguably the most critical component of the new eBusiness environment. An enterprise starts to become “extended” when its information systems face outward to enable connectivity with their

customers, suppliers and distributors. As a result of this:

- Manufacturing must be seen in the context of the total business and provide linkages of the business back through the supplier chain and forward to the customer chain.
- Organisations must facilitate inter-enterprise networking across the total value chain.
- The organisation must provide an environment where business partners work together for long-term business purposes based on mutual responsibility and loyalty.

The extended enterprise model recognises that success for manufacturing companies cannot be achieved by concentrating exclusively on the performance of the manufacturing facility per se, but is heavily dependent on the co-ordinated efforts of critical suppliers, distributors, etc., who must work closely together in a partnership mode to deliver a valued service to the customer (Browne, Hunt, & Zhang, 1998; Jadgev & Browne, 1998). Competitive advantage across the value chain is achieved by using information technology to achieve efficient linkage between the various actors in the value chain.

The creation of an extended enterprise is inevitable in order to efficiently utilise all of the relevant human, organisational, and business resources and to facilitate the necessary interdependencies between the suppliers (farmers), manufacturers, distributors, sellers and ultimately customers. In the Extended Enterprise model core product functionalities are provided separately by individual enterprises that come together to provide a customer defined product or service.

In the case of the “pizza” the manufacturing operation is usually defined as the conversion process of ingredients/raw materials at the factory gate (inbound logistics) to the production of finished products, bulked or palletised ready for dispatch to the distribution system (outbound logistics). Manufacturing therefore covers both process and packaging operations and there is close integration of both activities. The process side covers the bulk preparation of the product up to the formation of the consumer product (for example cheese and tomato pizza). The packaging side covers the assembly of the final product (for example carton and foil wrap of pizzas) ready for distribution. Usually the distribution centre acts as an external warehouse where orders from the retailer are processed, and then delivered to the retail outlet. For many leading consumer goods manufacturers the competitive environment of having supply chain integration and eBusiness initiatives is requiring them to restructure their logistics activities and develop integrated information technology systems. They are also moving to reorganise their business pro-

cesses, for example, order fulfillment as opposed to individual functions. Of these new strategies the concept of ECR is a major step forward for the food industry. However, realising the potential of ECR depends on the full application of two central points; supply chain partners working together and the need for a total system view of both supply and demand of products.

In the drive for reduced supply chain costs and improved efficiency across the supply chain this research identified a number of supply chain strategies that are currently being established. Strategies such as ECR, quick response, vendor managed inventory and cross-docking are linking raw material suppliers, manufacturers, distributors and retailers along a seamless supply chain. For the particular model being discussed in this chapter the quick response strategy within the food industry is explored. Fisher (1997) defines quick response as a partnership strategy in which retailer and supplier work together to respond more quickly to consumer needs by sharing information on the point of sale activity with the aim to jointly forecast future demand for replenishable items and to continually monitor trends to detect opportunities for new items.

Quick response is implemented by monitoring retail outlets for specific products and this information is shared across the supply chain thus guaranteeing that the right quantity of products will be available when and where it is required. For example, instead of operating on five- to ten-day order cycle a QR arrangement can replenish retail inventories in one day. Continuous information exchange regarding availability and delivery reduces uncertainty for the total supply chain and creates the opportunity for maximum flexibility. With fast, dependable order response, inventory can be committed as required, resulting in increased turnover and improved availability.

The following example illustrates how a QR arrangement would work for the pizza supply chain:

- Orders from the retail outlet are sent to the distribution centre (DC) via an EDI system.
- The DC then plans the most effective and efficient way to satisfy requirements. Specifics regarding the replenishment shipment are communicated to the retailer ahead of product arrival so that labour and deliveries can be scheduled. This performance arrangement reduces uncertainty, total cost, and inventory assets and typically improves service performance.
- Having reduced the response time, the supply chain players have an opportunity to decrease order quantities. First the retailers can decrease order quantities and also decrease stock levels at their premises. This in turn will cause an increase in the number of orders at the DC. However, the DC now can update their stocks more frequently. This will result in a more

accurate distribution plan and a decrease in safety stocks levels. Production planning at the manufacture site will also become more responsive to the current demand.

Retailers who take the lead in restructuring food supply chains demand shorter delivery times, more frequent deliveries and deliveries in smaller quantities from the food manufacturers. The aim is to lower stock levels throughout the supply chain and offers a varied range of fresh, frozen and long shelf life products when required. Implementing an enterprise-wide management solution such as quick response offers extended enterprises in the food industry improved management of their supply chain activities. These provide sufficient information for each party to plan product or material ordering and deliveries in the future.

6.2. Extended product

Products in the agri-food sector, as in the case of many other sectors, are becoming more information and knowledge dependent. The knowledge and information about a food product are becoming as important as the physical product itself. When a consumer or chef buys a food product they are interested in information such as origin, storage and traceability. In many cases they are also interested in new ways of preparing the product and how it can be used in recipes. In the case of one particular food wholesaler it was possible to provide an extended food product to their customers.

The wholesaler in question buys bulk food products and distributes to hotels and restaurants in Ireland. They stock a large range of products including fresh meat, chilled and frozen food and dry goods. The management team in the wholesaler realised that in order to stay ahead of their competitors they needed to become more than just a bulk-breaker of food product by offering more to their customers. They did this by “extending” some of their existing products using a virtual chef application.

The wholesaler has a vast range of products covering many of the recipe requirements of mainstream caterers. The extended product involved defining the relationships between some of these products in the form of menu recipes. The virtual chef as illustrated in Fig. 3 provide a number of menu options to the caterer.

The virtual chef is accessed using a web client. Personalisation and customer profiling ensure that only the menus that are relevant to a particular caterer are provided. In the first two steps the customer accesses menu files and chooses the appropriate menus. This service also provides a costing function allowing the chefs or restaurant managers to budget and price their own end product (i.e. the meal on their menus). The number of servings is chosen and the quantities of ingredients

are automatically calculated for the requested number. The quantities suggested are typically different to the container or product sizes and volumes available at the wholesaler so a batch calculation is provided which rounds the quantity up to the nearest container size or weight increment. This creates a standard order form in step 6 which is reviewed by the caterer and adjusted based on the levels of stock that they have in their own kitchen. When satisfied that the order is complete the caterer sends this back to the wholesaler and they process the order (step 7). The chef or caterer can also print out the recipe thereby completing the extension of the food product.

By simply providing additional information with the physical product they sell, the wholesaler has added value to their offering. The caterers get an extended food product, integrated into their usual ordering system that costs the same as the original product. The wholesaler gets customer loyalty bought by providing an extra service in a simple way. They also reduce the time needed by telesales operator as more customers begin to communicate with the virtual chef.

6.3. Combination of extended enterprise and products

The view of extended products in dynamic extended enterprises will affect future supply and delivery chains, and organisations business processes will need to adapt to these changes.

In the case of the animal feed and food industry the focus as previously mentioned, is shifting to the supply chain that sits in front of the food industry; the animal feed supply chain. The idea is to integrate the processes within this supply chain and to connect the two supply chains (food and feed) as illustrated in Fig. 1 in such a way that processes that cross-enterprises are completely integrated. As a result of this, feed manufacturers are developing codes of practice and traceability mechanisms in order to track feed products throughout the supply chain. Initially the feed producer orders feed supply from the feed supplier; this feed is then delivered to the feed producer. The feed is processed and supplied to the farmer. The farmer feeds his animals and after a period of time the animals are sent to slaughter. The animal is processed and raw material for the food supply chain is established. The raw material now enters into the food supply chain whereby the raw material is sent to the manufacturer and processed into food products and distributed to the food retailer. Finally the product is purchased and consumed by the consumer. Both industries now recognise that they must not only understand the product and information flows of their suppliers but they must also understand the immediate flows of the suppliers to their suppliers and also of their transport and processing links. The information and product flows of the animal feed and food industry are now

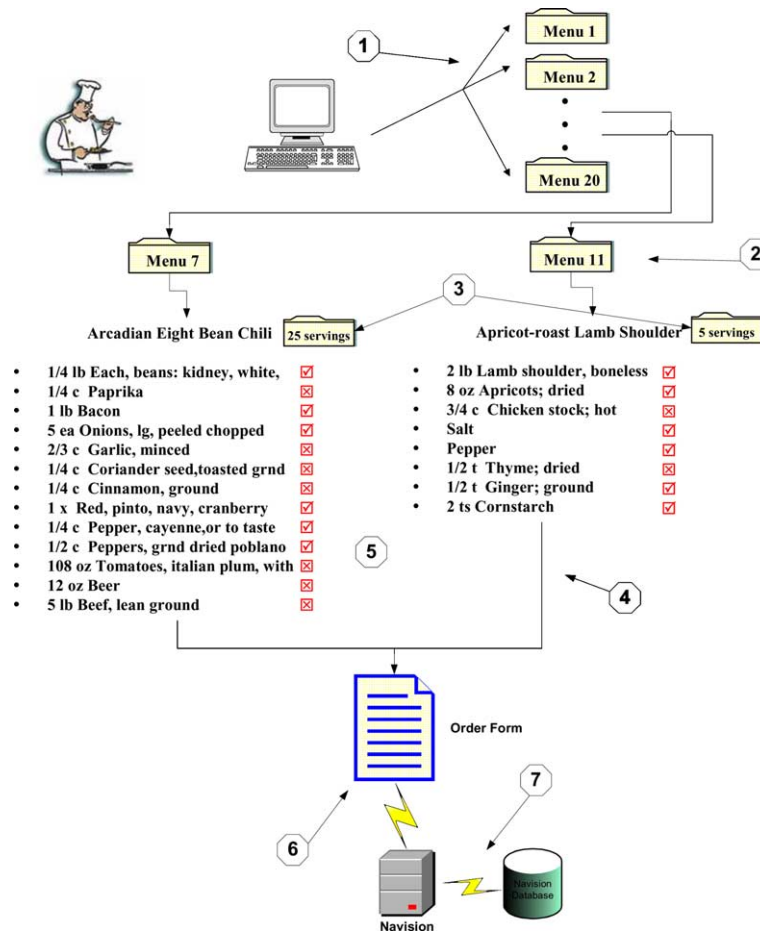


Fig. 3. The virtual chef “extends” the food product.

becoming an interconnected supply chain with a number of complex relationships. In response to these changes business strategies must now focus not only on traditional economical and technological interests, but also on topical issues such as safety of food and animal feed products, environmentally friendly production and still provide consumers with safe, quality and inexpensive food.

7. Conclusions

- The concept and the evolution of supply chain management and the effect eBusiness is having on the supply chain are creating important, fundamental changes in the way organisations operate internally and externally. eBusiness is encouraging companies to adjust their supply chain strategies and structures, as well as assessing their supply chain strengths and weaknesses, in order to operate in a digital business environment. This is particularly true in the animal feed and food industries, where larger organisations are encouraging integration and collaboration with their smaller suppliers. The extension of prod-

ucts will also play a major role in supply chain partnerships. These two industries represent an interesting opportunity for gaining insights into how organisations are beginning to explore supply chain management and eBusiness. Concepts such as extended enterprise and extended products are allowing these supply chain partners to redefine logistics flow, introduce collaborative partnerships so that the roles and responsibilities of partners are changing to improve overall supply chain efficiency and increase long term competitive advantage. However it must be noted that eBusiness is reaching the stage where the issues of collaboration and trust could be the most significant barriers to overcome. The business community needs to address this issue or the huge potential of eBusiness will not be met. The agri-food domain in general needs to dedicate time and resources to addressing the deficiency that exists with regard to eBusiness implementations. The European Commission has funded research in this area already, however more resources need to be directed at solving this problem if the European agri-food industry is to compete strongly in the world food markets.

Acknowledgments

This work has been partly funded by the European Commission through the IST Projects SMARTISAN: Smart Artisans (IST-2000-26267) and AFORO: Agri-food Roadmaps (IST-2001-37258) and also the project GEM: Global education in manufacturing (IST-2001-32059). The authors wish to acknowledge the Commission for their support.

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