**Lean or agile: A solution for supply chain management in the textiles and clothing industry?**

[*Margaret Bruce*](http://proquest.umi.com/pqdweb?index=8&did=580727281&SrchMode=3&sid=3&Fmt=4&VInst=PROD&VType=PQD&CSD=32260&RQT=590&VName=PQD&TS=1291257325&clientId=29440), [*Lucy Daly*](javascript:void(0);), [*Neil Towers*](http://proquest.umi.com/pqdweb?index=8&did=580727281&SrchMode=3&sid=3&Fmt=4&VInst=PROD&VType=PQD&CSD=550855&RQT=590&VName=PQD&TS=1291257325&clientId=29440). [**International Journal of Operations & Production Management**](http://proquest.umi.com/pqdweb?RQT=318&pmid=14900&TS=1291257325&clientId=29440&VInst=PROD&VName=PQD&VType=PQD). Bradford: [2004](http://proquest.umi.com/pqdweb?RQT=572&VType=PQD&VName=PQD&VInst=PROD&pmid=14900&pcid=11966991&SrchMode=3&aid=3). Vol. 24, Iss. 1/2; pg. 151

**Abstract (Summary)**

The textiles and apparel industry has been neglected in terms of supply chain management research. Recently, the industry has undergone a great deal of change, particularly with global sourcing and high levels of price competition. In addition, textiles and clothing has market characteristics, such as short product lifecycle, high volatility, low predictability, and a high level of impulse purchase, making such issues as quick response of paramount importance. This article discusses characteristics of the textiles and apparel industry and identifies the perspectives of lean, agile and leagility (a combination of these) within existing supply chain literature, which have been proffered as solutions to achieving quick response and reduced lead times. Through case studies of textile and apparel companies, different approaches to supply chain management are illustrated. [PUBLICATION ABSTRACT]

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Introduction

Textiles and apparel is a major sector for both the industrialised and the lesser developed economies, contributing both to wealth generation and employment. The sector represents a key part of employment in Europe, and also world-wide, and in Europe alone employs in excess of two million people (Werner Stengg, 2001). Turnover for 2000 was euro198 billion (Euratex, 2001). The European industry sector is dominated by large numbers of small- and medium-sized enterprises (SMEs), and in 1999 the average sized company had 19 employees (Werner Stengg, 2001). The major constraints that SMEs face include limited financial resources, a lack of personnel and time, little or no experience, and limited confidence in implementing new systems (Storey, 1994). As a result, many small companies are either unable or unwilling to invest in marketing, design and innovative activities (Carson, 1985). Globalisation is a key factor in the industry (Werner Stengg, 2001), and one of the biggest problems affecting the UK manufacturing industry is the increasing threat from low labour cost countries.

The UK clothing manufacturing industry has been facing major problems during recent years. There have been 50,000 jobs lost in the last two years, and it is expected that this trend will continue (Hind and Parsley, 2000). In July 2000 Marks and Spencer asked its suppliers to cut the prices of garments already produced by 2 per cent. Two of their main suppliers, Coats Viyella and Dewhirst, both refused to accept the cuts, and Coats Viyella has since announced the loss of 1,900 jobs (Hind and Parsley, 2000). The low valuation given to key brands in the sector reinforces the lack of confidence in the sector as a whole and the perceived risk of investing in them. In February 2000 the stock market valuation of the entire sector was calculated to be £740 million, a figure less than that of a single dot.com auction company, and considerably less than the combined turnovers of the companies within the sector (Key Note, 2000). This resulted in take-over bids for long-standing UK companies by large overseas companies. One example of this was the sale of the Pringle brand to the Hong Kong based Fang Brothers in February 2000 for £6 million (Key Note, 2000).

The textiles and clothing industry is highly diverse and heterogeneous. Definition of what precisely constitutes textiles and apparel is a matter of debate (Jones, 2002) and, in its broadest sense, the sector spans chemical conglomerates producing dyes, detergents and artificial fibres, to healthcare companies producing heart valves, prosthetics, bandages, etc., to niche design driven fashion companies. In the UK, all of the major retailers are in the textiles and apparel business and their buying power is able to "make or break" the success of particularly smaller suppliers, such as a young fashion design company. Retailers source globally for their textiles and apparel products to acquire these cost benefits and in time to meet their fast moving and demanding consumer needs. The trend for offshore sourcing has led inevitably to a decline within employment in industrialised nations for textiles and apparel. However, global sourcing does not always suffice to meet retailers' demands, particularly if they need to replenish a well selling stock mid-season, and so local suppliers are used in tandem with those offshore. Managing the logistics and supply chain for textiles and apparel suppliers and retailers has to be synchronised and is driven by the exigencies of the dynamic patterns of demand, especially for fashion items. This paper addresses approaches to supply chain management that adopt lean, agile and league supply paradigms and illustrates their application through cases studies from the textiles and apparel sector.

Lean, agile and league supply paradigms

The term "supply chain" is used to describe the flow of goods from the very first process encountered in the production of a product right through to the final sale to the end consumer. Harland (1997) suggests that the term supply chain management can be used to describe a number of concepts the processes inside a manufacturing organisation; purchasing and supply management occurring within dyadic relationships; the total chain; and finally a total firm network. It is suggested that the emphasis of supply chain management has changed in the past two decades; Stuart (1997) and Dossenbach (1999) argue that approaches to supply chain management are much more systematic, focusing on relationships involved. It is argued that in today's markets competition is no longer based on a company versus . company model, but instead is supply chain versus supply chain (O'Marah, 2001). Frohlich and Westbrook (2001) suggest that in order to see success, companies need to achieve integration external to the company, with customers and suppliers. Wong (1999) suggests that building partnerships with suppliers is considered to be a means by which to achieve best performance within the supply chain and that co-operation and collaboration in the supply chain are crucial to the success of the company (Eversman, 1999). Rich and Hines (1997) suggest that two perspectives can be taken on supply chain management - that of the internal supply chain, i.e. the conversion process between departments, and that of the external supply chain, i.e. the relationships with customers and suppliers.

Lean supply

Womack and Jones (1996) developed the idea of a lean enterprise concept as a group of individuals, functions and legally separate but operationally synchronised companies. The focus of lean supply management is the elimination of all waste, including time, to enable a level schedule to be established (Naylor et al, 1999). Lean manufacturing can be traced back to the Toyota production system (TPS) with its focus on the reduction and elimination of waste within the factory environs (Ohno, 1988). Its application was not extended to other parts of the supply chain where large quantities of finished product were stock-piled in anticipation of customer orders. Despite the presence of lean manufacturing facilities in the supply chain where throughput times were being dramatically reduced, customers would still experience significant delays for delivery of their orders (Fisher, 1997). Further work on the application of the notion of the lean enterprise to small businesses was developed by Karlsson and Ahlstrom (1997), which concluded that most of the theoretical principles contained in lean supply were applicable to SMEs. Abernathy (2000) proposes a model for a lean management of the supply chain for the textiles and clothing industry (Figure 1). He argues that lean retailers require rapid replenishment of products, and shipments need to meet strict requirements in terms of the delivery times, order completeness and accuracy. Key to this is the use of bar codes, EDI and shipment marking.

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| Figure 1. |
| Lean retailing-apparel supplier relations |

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Agile supply

The Iacocca Institute (1991) argued that an enterprise could thrive in an environment of rapid and unpredictable change, through acting in an agile manner. Enterprises needed to find an effective response to a constantly changing and highly competitive business environment. Hiebelar et al. (1998) developed the agile operation where minimal lead times are required to be able to service volatile consumer demand with high levels of availability. The agile supply chain has a number of distinguishing features. It is market sensitive with the ability to respond to actual real time changes in demand. Organisations must acquire capacity capability in order to be able to react to possible volatile fluctuations in demand. The use of information technology to share data between buyers and suppliers is crucial for agile supply (Harrison et al, 1999). This will improve visibility of requirements and reduce the amount of stock held in anticipation of predicted and often distorted demand (Hewitt, 1999). Shared information between supply chain partners is necessary to sustain the extended enterprise where collaborative alliances support the exchange of information to enable such activities as joint product development and common systems. Childerhouse and Towill (2000) argue that the adoption of the lean principles are appropriate for commodity products where demand can be predicted and agile principles are relevant for innovative products where demand is unpredictable. Table I emphasises the attributes of lean and agile supply.

League supply

The concept of "league" supply chains has been promulgated (e.g. Van Hoek, 2000; Mason-Jones et al, 2000; Naylor et al, 1999). "League" takes the view that a combination of lean and agile approaches be combined at a decoupling point for optimal supply chain management. Mason-Jones et al. (2000) argue that agility will be used downstream and leanness upstream from the decoupling point in the supply chain. Thus, league enables cost effectiveness of the upstream chain and high service levels in a volatile marketplace in the downstream chain. However, Van Hoek (2000) argues that although a league approach to supply chain management may work in an operational sense, it makes no sense to fundamentally challenge the concept of agility, as it has to fit with an agile approach to supply chain management in order to be applied properly.

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| Table I. |
| The distinguishing attributes of lean and agile |

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Supply chains in textiles and clothing

The supply chain in the textiles industry is complex. Often the supply chain is relatively long, with a number of parties involved (Jones, 2002). Consequently, careful management of the supply chain is required in order to reduce lead times and achieve quick response, highlighting the need to use an approach such as agility.

It is common practice for retailers to deal with manufacturers, with centralised buying and considerable negotiation on prices, quality and delivery schedules (Bruce and Moger, 1999). However, Popp (2000) suggests that in addition, in many chains there is an intermediary, often an import or export agency, acting as a significant figure within the chain. The addition of the intermediary has come about as a result of increasing globalisation within the industry. Globalisation of the textile and clothing supply chain is currently intensifying, with many companies either sourcing components from overseas, or moving manufacturing to countries with lower labour costs (Jones, 2002). In addition, the fashion industry is characterised by a number of factors, namely a short lifecycle, high volatility, low predictability, and high impulse purchase (Fernie and Sparks, 1998).

Relationship management is a well-trammelled area (Ford, 1980; Buttle, 1996) and encompasses the management of the chain and the building of partnerships between different parties within the chain. Throughout the literature, collaborative relationships and partnerships are described as preferential situations, and as beneficial to all parties involved (Wong, 1999; Dossenbach, 1999; Bowen, 2000; Harland, 1996; Lamming, 1996; Bidault and Cummings, 1994; Valsamakis and Groves, 1996). However, this view is questionable in many situations. For example, the textiles industry tends to be dominated at the end of the chain by large, powerful high-street retailers with multiple and often internationally located outlets. Further back down the chain, the manufacturing sector of the industry consists of large numbers of small companies with a limited amount of power (Werner Stengg, 2001; Key Note, 1996; Towers, 2000). Although it may be argued that partnership agreements exist between these companies in the textiles and clothing industry, it is questionable whether these are actually partnerships with benefits for all parties or whether these are a means by which the retail sector is able to exert power over the smaller suppliers in order to push down prices (Bhamra et al, 1998). With the intensification of globalisation and the quest to achieve greater profits through reduced purchase prices, the industry has moved away from partnering between organisations Qones, 2000).

A number of strategies have been employed in the textiles and clothing supply chain, in order to improve supply chain management, including quick response and accurate response (Chandra and Kumar, 2000). JIT (just-in-time) is also common in textiles and clothing and is the delivery of finished goods just in time to be sold throughout the supply chain. Bhamra et al. (1998) highlight that to counteract the threat of the increasing number of imports and levels of overseas sourcing, the UK industry needs to concentrate on quick response methods such as flexible delivery through domestic sourcing, reduced levels of stock within the supply chain, and increased net margins.

The lean, agile and league approaches to supply all effectively sequence and manage the manufacturing process in order to reduce lead times. Key to this is improved customer order demand management and a reduction in wasteful activities. This is crucial because in all enterprises there is a finite amount of resource available. Consequently, scheduling for shop floor control in a production environment has become focussed against wastage in manufacturing and supply. This is particularly relevant to the textiles and clothing industry, in response to increased competition and compounded with small businesses where the problem becomes more acute with less resource available. The challenge enterprises face is to either focus on speed and efficiency through the supply chain to replenish a pre-determined stockpile, or to produce exact quantities in response to servicing customer orders effectively. The research illustrates how companies in the sector manage to service the demands of speed and efficiency whilst responding with flexibility to demand fluctuations.

Aim of the research

The overall aim of the research is to consider the supply chain management approaches used in the textiles and apparel sector. This is addressed through case studies of companies at different points of the textiles and apparel chain, ranging from fibre producers downstream in the chain to manufacturers and retailers upstream.

Methodology

As the research was exploratory in that it addressed a sector where little research into supply chain management had been undertaken previously, then a qualitative approach was chosen, based on detailed case studies (Yin, 1994) to map out particular supply chains and to gain insight into the pattern of supply chain management that was in evidence. To construct the cases, semi-structured interviews were carried out with key stakeholders in the sector and, where available, relevant secondary data were also used, such as company reports, Web sites, etc. The secondary data provided background and context to the primary research data gathered from the interviews. Semi-structured interviews were conducted using an aide-mémoire; to enable comparisons to be made and also to allow some flexibility in the responses made by the research participants. Companies that represented different facets of the textiles and apparel supply chain were selected for the research, ranging from one end of the spectrum, fibre companies, to manufacturers of apparel, to design companies in contract furnishings to, at the other, retailers. Senior managers in product development, design and/or technical functions were approached in the textile and apparel companies, as they were dealing with suppliers. The senior managers worked with customers to understand and exceed their requirements and collaborated with suppliers to capture innovative ideas within cost parameters. In retailing, senior managers responsible for product development, purchasing and/or supply chain management were approached, again as these had relevant knowledge for the research. These managers were contacted by letter, which explained the purpose of the research and asked for co-operation, and then by telephone to provide more details and to arrange interviews. Once interviews had been confirmed, then face-to-face interviews were carried out and these lasted approximately one to two hours each. The interviews were taped, transcripts were produced and sent back to the interviewee for validation. Two researchers carried out each interview, so that full observation and thorough probing could take place. This also provided a reliability check, as the researchers could compare notes after the interview and agree on the authenticity of the recorded material. The questions addressed in the aide-mémoire are shown in the Appendix.

The transcripts, notes and secondary material were integrated to produce cases of supply chain management in the textiles and apparel sector. A number of key themes relating to the research objectives were identified and used to organise the material and then to compare across the cases (Saunders et al, 2000). With the input of two researchers and the research team, it was possible to identify salient themes and issues. These themes form the basis for the structure of the cases presented here.

Company 1: manufacturer of high street fashion

Company 1 is a UK-based SME supplying womenswear and has been operating since 1968 with 16 employees. The business started primarily as a wholesale and cash and carry business, but over the last four to five years has increasingly developed its own garment ranges. The product ranges consist of womenswear for the fashion mass market. With the shift to own manufacture the company has had to invest in design skills, and currently has four full time design employees. The supply chain is shown below in Figure 2.

The company does not produce any textile products and they are sourced from manufacturers, either directly or through agents based in London. The company has recognised the importance of overseas manufacturing to remain competitive and has followed the lead of major manufacturers. However, increased lead times and difficulties with communicating changes to designs have become inevitable consequence of this strategic move. Subsequently, to guarantee success the company needs to set up certain systems to improve efficiency.

Overseas sourcing and manufacturing

Sourcing of textile fabrics and the making up of finished garment both have to be sourced and supplied in accordance with extremely tight deadlines. Company 1 sources most of its textile fabrics from the Far East. Many of the fabrics are purchased through agents, who offer better prices than buying direct and it makes it easier to rectify any problems that might occur. The majority of the garments are manufactured in Morocco and Cyprus, with the remainder sourced from the UK. This choice of location has been a strategic decision as the lead times are approximately three-four weeks shorter than they are for suppliers based in the Far East. However, as quality is also an issue for the company, Eastern Europe was not a feasible choice due to previous experience of poor quality production.

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| Figure 2. |
| Supply chain for company 1 |

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Lead times

Company 1 has set up effective systems to control the manufacturing process for "quick response". The whole planning process utilises back scheduling from the date when the garments need to be delivered to the customer. A definite cut off point exists after which customers will not receive deliveries. These dates are used to establish when fabrics have to be delivered to the clothing manufacturers. This depends on where the garments are being manufactured, in Morocco and Cyprus the lead times are six weeks, and in the UK the lead times are four weeks. The fabric production from the Far East takes eight weeks, four weeks to produce and four weeks to ship, and the design and choice of colour and style of the fabric takes another four weeks. The company is turning around new ranges every 18 weeks to meet the changing demands of high street fashion retailers.

Computerisation

The company has invested in a new on-line computer system so that the stage of development for each batch of fabric and garments can be tracked. A CAD system is used for the fabric. Despite the availability of on-line systems, the company has learnt that communicating with the fabric manufacturers based in the Far East is essentially still carried out by post. This makes the whole operation nerve racking and risky. In the future Company 1 would like to see their manufacturers on line as well, to speed up the process and reduce risk.

Controlling the production process

Mistakes are costly, and to prevent them occurring Company 1 has had to change some of its operating systems. In the past the company was placing too much demand on some of its manufacturers and as a result manufacturers were unable to keep to deadlines. The knock-on effect was potentially damaging for the relationships that Company 1 had cultivated with its customers, which were in danger of breaking down. The company has a schedule to identify exactly how much work each factory has to deal with on a weekly basis. It feels that although this is useful in its manual form, it could be much more effective when computerised, and this is the next step in the change process.

The company uses two different carrier companies, one for Morocco and one for Cyprus. The carrier companies ship everything to the manufacturers, including the fabrics, buttons, threads and bags. Until recently, the stock from Cyprus was being finished in London because it was cheaper to fly the garments folded and boxed and then put on hangers in the UK than to carry them on hangers directly from Cyprus. However, this created a bottleneck. The company has recently negotiated an arrangement with the carriers to ship the garments on hangers. Currently, the outsourced manufacturer carries out the entire manufacturing process, including the garment costings. This is another problem area for Company 1 because it has to trust the manufacturer's estimated costs and these can be within 5 per cent of the actual cost. But in the future Company 1 intends to have the capabilities to control the costing process and agree these with their manufacturers.

Company 1 aims to store as little stock as possible. It makes conscious efforts to co-ordinate incoming and outgoing stocks. If it is unable to get the delivery dates it requires it has to hold the stock at the premises, which can cause problems with space. In the near future it hopes to computerise this process, to make it more efficient.

Relationships

Company 1 sees the benefits of building good relationships with its customers and suppliers. It takes the view that it is crucial for both parties in the relationship to actively grow together. However, as a SME manufacturer the company feels that it is too reliant upon a small number of large customers. This results in its feeling vulnerable as the customers hold the power in the relationship. The company takes action to positively maintain its relationships and this has been shown in a strategic move not to take on extra work in case it jeopardises current or future relationships.

Summary

Company 1 has been able to remain competitive in a market where many small companies are facing immense difficulties to survive. This is a direct result of the decision to source and manufacture overseas. The company has to respond to short product lifecycles and rapid product replenishment and achieves this through its flexible management of its supply base by using a mix of overseas and UK based companies. The success can be seen from the continuing interest from new and influential fashion retail customers. However, this success has not come easily. The company has had to completely re-organise its manufacturing and organisational structure through investment in a computerised process, in order to make the overseas manufacturing successful. However, for this process to be used to its full advantage, similar systems will need to be introduced into suppliers, in order to speed up communications. The relationships that it has built with both customers and large players within the market are strong, and these can only serve to enhance the future strategies of the company in terms of expansion.

Company 2: fibre producer

This company has sales of euro2.2 billion and employs 16,000 people. Production facilities are based in Germany, The Netherlands, the UK, the USA, Brazil, Italy and Poland. It produces fibres and has a number of well-known brands in the marketplace. End market users for Company 2 range from sportswear companies to hotel chains for antimicrobial fibres for bedding and interior textiles. Branding is used extensively, and brands are being licensed to other products, such as soaps.

Company 2 has found that competition has intensified in the sector in recent years, and trading conditions are more difficult. It has had to focus on added value products, as it was unable to remain competitive by supplying commodity products, as other countries, such as Turkey and China, are able to produce these much more cheaply. However, it recognises that now these countries are also able to produce technically complex products, so again competition is getting tougher.

Sourcing and manufacturing

The company has two types of relationships with suppliers, according to the need at the time, as shown in Figure 4. For example, if it requires a simple and risk-free component that is used on a regular basis then it will source from a low-cost overseas supplier. However, if a technically complex component is needed on an infrequent basis, then it will source from a large, technically advanced supplier such as CIBA or BASF to ensure that it secures the premium technical advice that it can acquire. UK reputation is important for its customer base, particularly for sophisticated products. These require some degree of technical back-up as opposed to low value commodity product. The supply chain for Company 2 is shown in Figure 3

Increased lead times

Company 2 supplies fibres to the trade and so its customers convert the fibre into end user products, such as sportswear, apparel, furnishings, etc. To "pull" new fibre products through the supply chain and into the end user markets, Company 2 also informs end users, such as retailers and branded sportswear companies, about its new products. The intention is to speed up market awareness and the adoption of new products into the marketplace. By contacting the end customer directly, Company 2 is able to steer its applied R&D activities closely to market requirements (Figure 3). To manage this process, a research group has been established to proactively seek new market opportunities and to work to short lead times of six months, rather than the current time-scale of more than a year. The aim is to be a market leader rather than a follower in the market to withstand the competition from low-cost producers.

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| Figure 3. |
| Supply chain for Company 2 |

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1 Relationships

In a number of cases the company forms strategic alliance partnerships with key customers. The preferred alliance is with customers who are more technically knowledgeable, who wish to invest in the development of new products and who contribute to the discovery of solutions to problems.

Summary

With the intensification of competition and speed of change in the sector, fibre producers, as exemplified by Company 2, are having to become responsive to market demands by using brand reputation as a form of protection against cheaper products and by forming business alliances to generate innovation to respond to both shorter-term market demands and to invest in longer-term R&D.

Company 3: sportswear accessory design

Company 3 is a small start-up company involved in designing and sourcing the manufacture of headwear and accessories for the sportswear industry, and is currently also moving into the fashion industry. It currently has ten employees based in the UK and a further two based in Europe. The company is in its fourth year of trading and had an annual turnover of £1.5 million in the year 1999-2000.

Sourcing and manufacturing

Company 3 has two main suppliers, namely a UK manufacturer and a manufacturer in the Far East. Figure 4 maps out the key participants in the supply chain for the company. The UK manufacturer is used for sampling and for production runs of less than 1,000 pieces. The process with the UK manufacturer takes approximately six weeks. The company uses the Far East manufacturer for production runs in excess of 1,000 pieces and the process can take up to nine weeks due to shipping time. The main benefit from using an overseas manufacturer is the substantial saving in cost, as the margins are small on products produced domestically. However, the UK manufacturer provides flexibility for quick response. Both manufacturers produce samples and manufacture the final product. The manufacturing companies also source all of the components. The supply chain for Company 3 is shown in Figure 4.

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| Figure 4. |
| Supply chain for Company 3 |

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Relationships

To differentiate the product and stay one step ahead of competitors, Company 3 has developed a Thinsulate fleece lined ski hat, with a circular knit outer shell. The product was initially targeted at athletes who take sport seriously and fashion consumers who seek added value from a hat. The product is a technical development of a ski-hat produced from the previous year's collection. A Thinsulate lining was chosen as it was considered not too technical, is inexpensive and is widely known both within the industry and amongst consumers. The material is also readily available in the Far East where Company 3 conducts much of its manufacturing. This was of paramount importance for the company as communication with Far East suppliers is often a protracted process and accurately describing technical fabrics can be difficult, often resulting in misunderstanding and the wrong fabric being used if a branded fibre or fabric is not selected.

The key relationships are between the designers and the manufacturer. Alongside these relationships were the sales/development function that acts as the link between the company and the customer. Defining the product brief, securing and checking samples against the brief and managing customer feedback from sales were all critical aspects of relationship management.

Summary

The overseas manufacturer was able to produce products at a cheaper cost than the UK supplier, but the lead times proved to be long. By using a combination of UK and overseas suppliers working to the same product brief, making the same samples and end products to the same specification enabled this start-up company to position itself primarily in the sportswear market. The UK supplier was able to guarantee delivery and get the product into the marketplace on time, but could not do so at the cost that the overseas supplier was able to command. By using a mixed supply base, Company 3 was able to optimise its own situation.

Company 4: a premium brand manufacturer/retailer

The company

In 1970 Company 4 opened its first shop and today has over 220 shops world-wide, with merchandise sold in over 42 countries, and an annual turnover in excess of £180 million, whilst remaining self-financed. Since the debut of this first line in 1970, Company 4 has flourished from a menswear designer name into a global designer lifestyle brand. Company 4 is made up of four complementary sub-brands that address the different lifestyles of the modern individual. Pre-tax profit for the company in 1999 was £4.4 million and the company had 376 employees. This shows considerable growth in both areas from 1998, when the company had a pre-tax profit of £3.4 million and 347 employees. The Japanese operation contributes 80 per cent of the £180 million sales turnover of Company 4, with 11 per cent of the turnover generated in the UK and the remainder largely coming from Europe (8 per cent).

The company strategy is to be respected as one of the exclusive names in design, remaining modern and relevant, maintaining the high quality design profile. The company hopes to progress by opening more shops, entering into more licensing agreements, catering for the rich and famous to maintain the company's profile, and through investing in advertising. This case considers the collection for Company 4. The collection ethos is "classic with a twist" and is a high quality and innovative collection, for the top end of the market. The collection is not constrained by commerciality. Inspiration can come from all aspects of life, including films, popular holiday destinations, music, restaurants and clubs. The supply chain is shown in Figure 5.

Relationships

The company has developed and maintained close relationships with manufacturers, some of whom have been working with the company for 15 years. The company values these relationships because the small order quantities required by Company 4 can cause difficulties for some suppliers. The company has built close relationships with approximately ten mills. These mills are known for their innovative fabrics. Company 4 plays an active role in building the relationships, regularly visiting the mills to sustain the personal rapport. It also has a portfolio of another 20-30 companies that it uses on a less frequent basis. The company also has "flavour of the month" mills, which tend to have a short-term relationships with the company, often only lasting for up to two seasons. The company tries not to work through agents.

The company invests in relationships with the mills and manufacturers at all levels, as frequently it requires special requests for one-off pieces and small order quantities. There is a certain amount of prestige taken by the manufacturers from working with a "catwalk" collection, and this often works in favour of the company. Nonetheless, these relationships are heavily invested at all levels throughout the company. Building close relationships with the mills allows Company 4 to overcome any problems and negotiate on volume and lead times to their mutual benefit.

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| Figure 5. |
| Supply chain for Company 4 |

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Conclusions

Textiles and apparel is characterised by volatile markets, short product lifecycles and high product variety. The sector has extremely low profit margins so that producing and even holding small quantities of stock is not commonly a viable option. Therefore companies in the sector have to produce products rapidly to fulfil these orders. Company 1, a fashion producer for the high street, manages its manufacturing activities by producing overseas to take advantage of low costs, with an ability to meet short-lead times with a UK based production facility. Investment in CAD/CAM and ICT serve to shorten lead times further so that the company can be even more responsive and closer to market demands. The company recognises that good relationships with suppliers are essential to exploit this technology and to obtain premium service from suppliers to meet the changing demands of the UK retail market. Company 1 illustrates a league approach. Similarly, Company 3, which designs and supplies accessories primarily to the sportswear market, adopts a mixed supply base approach. It utilises a blend of cost-effective overseas suppliers and short lead-time UK manufacturers able to supply product to meet market demand. What is interesting is the fibre producer (Company 2), which works to long lead times and deals with large production runs and so falls into the lean perspective. However, to deal with intensification of competition and dynamic demands, the company is proactive in forming business alliance to "pull" product into the marketplace quickly. In this way, the company is exhibiting an agile approach. Company 4 also focuses on building relationships, again to achieve leagility in the supply chain. This is essential as the company is dealing with a high quality fashion product with small batch quantities.

The cases illustrate that companies in the textiles and apparel sector utilise aspects of both agile and lean perspectives. With the prevailing characteristics of the textiles and apparel sector, a combination of the two perspectives leading to a league approach was seen to be evident. In summary, companies in textiles and clothing need to be able to respond quickly to changing markets and be able to provide quick replenishment. However, they are not able to store large quantities as products have a very short life cycle and fashion markets are seasonal. As low cost overseas manufacture is widely used in order to meet the reduced prices demanded by retailers, extended relationships with suppliers are key to supply chain management. Therefore, it can be argued that the textiles and clothing industry does not neatly fit into either a lean or agile paradigm, but instead it is a combination of the two driven by low margins and volatility of demand. This would ensure fast product replenishment, the building and maintaining of supply chain partnerships and flexibility in response to the volatility of demand from retailers.

This paper has sought to contribute to the debate of lean and agile supply within the textiles and clothing industry. The cases have provided a greater understanding of the different supply paradigms adopted by this heterogeneous and diverse sector. The trade off between cost of production, lead-time of supply and volatility of demand within the sector continues to act as a focus for improved responsiveness and developed relationships. It is proposed that further research should be undertaken to extend the understanding of supply chain management for fashion and commodity garment manufacture and supply.

**Supply chain design in the food industry**

[*Jack G A J van der Vorst*](javascript:void(0);), [*Stephan J van Dijk*](javascript:void(0);), [*Adrie J M Beulens*](javascript:void(0);). [**International Journal of Logistics Management**](http://proquest.umi.com/pqdweb?RQT=318&pmid=37879&TS=1291257972&clientId=29440&VInst=PROD&VName=PQD&VType=PQD). Ponte Vedra Beach: [2001](http://proquest.umi.com/pqdweb?RQT=572&VType=PQD&VName=PQD&VInst=PROD&pmid=37879&pcid=1894581&SrchMode=3&aid=4). Vol. 12, Iss. 2; pg. 73, 13 pgs

**Abstract (Summary)**

The concepts of hybrid supply chain strategies and the decoupling point are applied to a poultry supply chain experiencing high demand uncertainty in an inflexible production environment. Several solutions are proposed for this supply chain to cope with high demand uncertainty. The customer order decoupling point, the product differentiation point and the information decoupling point play a central role in these solutions. Because of specific characteristics of the poultry supply chain, the opportunities for a leagile supply chain design are limited.

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| The concepts of hybrid supply chain strategies and the decoupling point are applied to a poultry supply chain experiencing high demand uncertainty in an inflexible production environment. Several solutions are proposed for this supply chain to cope with high demand uncertainty. The customer order decoupling point, the product differentiation point and the information decoupling point play a central role in these solutions. Because of specific characteristics of the poultry supply chain, the opportunities for a leagile supply chain design are limited. |

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Since the 1990s a lot of attention has been given to supply chain management and a number of frameworks and tools for improvement have been presented in literature [1]. Each of these frameworks should help management in deciding how their particular company's situation could be improved. One such framework is proposed by Marshall Fisher [2] suggesting that the nature of the demand for the product should be carefully considered before a supply chain strategy is (re) devised. Fisher divides products into two categories:

Primarily functional products satisfying basic needs which have stable, predictable demand and long life cycles typically with high levels of competition resulting in low profit margins. These supply chains should focus on efficiency/leanness to minimize the physical costs related to production, transportation and inventory storage.

Primarily innovative products with higher profit margins have unpredictable demand and short life cycles and, usually higher levels of product variety. These supply chains should be designed focussing on responsiveness/agility to minimize market mediation costs, the cost that arise when the variety of products reaching the marketplace does not match what consumers want to buy resulting in lost sales opportunities and dissatisfied customers (see Table 1).

Fisher states that the root cause of the product availability problem is a mismatch between the type of product and the type of supply chain. For this reason, he advocates that the nature of demand for products should be considered, before devising a supply chain. However, it is not necessarily the case that a supply chain should be either lean or agile [31. Mason-Jones, et al., [4] and Christopher and Towill [51 stated that the supply chain strategy and structure should be in tune with the characteristics of the marketplace. They focus on hybrid strategies by integrating the lean and agile paradigms. Combining agility and leanness in one supply chain via the strategic use of a decoupling point has been termed "leagility" [6]. Naylor, et al., [7] define leagility as "the combination of the lean and agile paradigm within a total supply chain strategy by positioning the decoupling point so as to best suit the need for responding to a volatile demand downstream, yet providing level scheduling upstream from the decoupling point". The decoupling point refers to the point at which real demand penetrates upstream in a supply chain. According to Christopher [8] the challenge to supply chain management is to seek to develop lean strategies up to the decoupling point, but agile strategies beyond that point. By using generic or modular inventory to postpone the final commitment, it should be possible to achieve volume-oriented economies of scale through product standardization.

As a result of developments in food markets such as globalization, a shift of power to retailers, and especially masscustomization, a number of food products can be characterised as functional products with volatile and unpredictable demand. Retailers set the prices and demand frequent and responsive deliveries at short notice. Demand uncertainty has grown for these companies while production flexibility is still rigid. Because these functional products have a low margin, investments in supply chain responsiveness are not automatically paid back. What strategy should be followed when a push-oriented inflexible food supply chain with perishable, primarily functional products has to cope with high demand uncertainty and markets that request high responsiveness? This will be the central issue in this paper. We will focus on the specific problem of the case company, Wings & Legs, and its supply chain. As will be shown, the applicability of the concept of leagility is limited in the case, but does give some interesting insights in improvement-opportunities.

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| Table 1 |

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Leagility: Combining the Lean and Agile Paradigm

Agility is a business-wide capability that embraces organizational structures, information systems, logistics processes and, in particular, mindsets [9]. Agility means using market knowledge and a virtual corporation to exploit profitable opportunities in a volatile marketplace [10]. It is the result of current market developments making customer demand very volatile and unpredictable while still requiring short lead times. A key characteristic of an agile organization is flexibility. To be truly agile, a supply chain must possess a number of distinguishing characteristics [11]:

Market sensitive: the supply chain is capable of reading and responding to real demand.

\* Vital: using information technology to share data between buyers and suppliers.

\* Process integration: referring to collaborative working between buyers and suppliers, joint product development, common systems, and shared information.

\* Network based: organizations have to structure, coordinate and manage their relationships with their partners in a network committed to better, closer and more agile relationships with their final customers.

The characteristics of the lean company and the lean supply chain are described by Womack and Jones [12] providing a vision of a world transformed from mass production to lean enterprise. The authors highlight the huge amount of waste that occurs in most organizations and show that a systematic attack on waste, both within companies and along the supply chains, can have tremendous benefits to the short run profitability and long term prospects of companies and organizations. To satisfy customers a company needs to eliminate or at least reduce the wasteful activities for which customers do not wish to pay. Lean is about doing more with less. The term is often used in connection with lean manufacturing to imply a zero inventory, just-in-time approach [13]. The origins of lean manufacturing can be traced to the Toyota Production System, with its focus on the reduction and elimination of waste.

Both agility and leanness focus on customer responsiveness since one of the main principles of lean supply is to make only what is pulled by the customer. However, leanness emphasizes efficiency and cost reduction and thus deals with the trade-off between long lead times and the presence of inventory (both are considered waste). Economic trade-offs based on physical assets, labor, capital and land are most relevant in the functional, lean environment that is focussed on eliminating waste in operational processes [14]. Trade-offs based on time, information and knowledge are more relevant in the innovative, agile, environment. Leveraging information and knowledge is one of the primary dimensions of the agility concept [15]. Leanness departs from a relatively stable market demand and searches for an optimal supply chain design at the lowest cost. Agility emphasizes the fast response to changing customer demand, since product availability is considered the market winner [16]. However, cost is an important market qualifier, and this is usually reduced by leanness. The solution is to utilize the concept of the leagile supply chain and position the decoupling point in the optimal location [17]. Table 2 presents the differences of lean and agile supply on some distinguishing attributes.

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| Figure 1 |

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Leagility and Decoupling Points

A central notion in the strategy of leagility is the supply chain decoupling point. Processes upstream from this decoupling point should focus on leanness; processes downstream from the decoupling point should be focussed on agility (see Figure 1) [18]. The Customer Order Decoupling Point (CODP) is associated with the point that separates the part of the supply chain geared towards directly satisfying customer orders (order-driven or demand-driven) from the part of the supply chain based on planning (forecast driven) [19]. However, the issue in supply chains is not how far the order penetrates, but how far real demand is made visible in the supply chain [20]. Orders are aggregations of demand, often delayed and distorted due to the actions and decisions of intermediaries. On the other hand, demand reflects the ongoing requirement in the marketplace as close to real-time as possible.

Christopher and Towill [21] go beyond the one-dimensional perspective of the decoupling point and recognize two types of decoupling points in real-world supply chains. First, they distinguish the Information Decoupling Point (MP), stating that it represents the furthest point to which information on real final demand penetrates. Upstream from the IDP processes are forecast-driven and based on planning; downstream processes can be demand driven and based on real-time demand. The idea is that the IDP should lie as far as possible upstream in the supply chain. This is in accordance with the general findings in SCM literature that demand information should be exchanged in the supply chain as far upstream as possible.

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| Table 2 |

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Secondly, Christopher and Towill distinguish the Material Decoupling Point (MDP) where strategic inventory is held in as generic a form as possible. They refer to the concept of postponement [22]. By delaying product differentiation one delays for as long as possible the moment when different product versions assume their unique identity, thereby gaining the greatest possible (mix) flexibility in responding to changing consumer demands. Postponed manufacturing equates to assemble to order where fabrication of parts is standardized, but the assembly and distribution process is customized [23]. Postponement is based on the principle of seeking to design products using common platforms, components or modules, but where the final assembly or customization does not take place until the final market destination and/or customer requirement is known. Downstream from the MDP products or goods are differentiated to specific customers or markets. Upstream from this point (production) processes are generic, which means no customer or market-specific attributes or value is added to the products. The MDP ideally should lie as far downstream in the supply chain and as close to the final marketplace as possible [24].

According to Christopher and Towill, the challenge to supply chain management is all about the effective management of these two decoupling points. However, some questions appear when you relate these two decoupling points to the concept of leagility.

First of all, the IDP is not the point to which information about actual endconsumer orders penetrates the supply chain, but is the point to which information about final consumer demand of an earlier moment is made visible. This means that downstream of the IDP processes are not driven by actual orders, but that they are driven by demand data. This is the case in most ECR food supply chains; producers receive EPOS data of today and replenish the inventory of distribution centers and retail-outlets for the next day. The actual order of an end-consumer in retail outlets has already been fulfilled at that time; the end-consumer has already bought his or her product. Actually, in this case the EPOS data of today is used as a forecast of the demand of the next day.

The exchange of EPOS data requires data translation capabilities; the organization should be able to use the EPOS data for planning purposes. For example, a potato supplier to a salad producer has no use for consumer demand data of salads in retailer outlets if he cannot translate them into quantities of potatoes, especially if he is not the only potato supplier to that particular producer.

The MDP is directly related to a certain position of the CODP (assemble to order).

In practice it is possible that the Point of Product Differentiation (PDP) is not the same point as the CODP. For example, customer orders can be sent further upstream in the supply chain than the PDP. In that case this information can be used to improve the customer-relatedness of the strategic inventory (to agile supply) or the information is used to plan efficient production runs (to lean supply). When the CODP is located downstream of the PDP, it means that products are made customer/market-specific and stored in this way at a central strategic inventory point (the CODP). There is a risk that the wrong product-variant has been produced for the wrong customer. Hence, flexibility of the strategic inventory at the CODP is low. It is worthwhile to either move the PDP downstream to the same point as were the CODP is located or move the CODP upstream. In the first case, the flexibility of the strategic inventory increases and customer or market specific attributes and value are only added to the product when actual customerorders are known. In the second case, the risk of obsolescence could be reduced. Postponing the PDP has to be evaluated relative to the position of the CODP.

Although demand information could penetrate the supply chain far upstream, it does not automatically mean that all processes downstream from that IDP are designed for agility. Demand data could also be used to make production even more efficient and still pursue a lean approach.

The Poultry Supply Chain

Poultry supply chains in the Netherlands are confronted with increasing demands from customers concerning customer service elements and governmental rules concerning quality and environment. The current way of working must change to remain competitive in the future. In this case analysis we will use the concept of leagility and the decoupling points to distinguish multiple alternative supply chain designs. First, we will present a short summary of the case methodology. Second, a review is given of the case company Wings & Legs and its supply chain with respect to market and demand characteristics. Third, the possible strategic positioning of the PDP/CC)DP and the IDP are considered. Finally, an overview of identified improvement options is presented.

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| Figure 2 |

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This case is part of a ten-month research project, which has been performed at several companies in a poultry supply chain in the Netherlands. All companies belong to the same cooperative organization resulting in high trust level between them. Cooperation takes place on product specifications, quality and specifications of raw materials. In Figure 2 an overview of the relevant actors in the poultry supply chain is given. During this project several interviews have been held with senior managers of each company. Most information has been gathered at the poultry processor company. Because the CODP is situated at this stage in the supply chain, most complications arise at this point, where a level supply meets a variable demand. An analysis of the production planning and control structure of the poultry processor was performed and improvement options defined.

Several characteristics of demand and market determine the operations strategy of the supply chain. These are the product/demand characteristics [25] and market qualifying and market winning factors [26]. Both of these classifications will be used to describe the supply chain market and demand characteristics.

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| Table 3 |

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Wings & Legs, the poultry processor, produces fresh poultry products for the consumer market. It supplies retail distribution centers, which distribute poultry products to the individual retail outlets. Fresh poultry products are typical commodity products with low profit margins. The market winner in the Netherlands is still cost. Market qualifiers are quality, lead-time and service level. This holds true for the end consumer, who buys its products in retail outlets, and for the retailer, who is the direct customer of Wings & Legs. One could argue that, because of the growing attention for food safety and recent outbreaks of animal disease, quality is moving from a market qualifier to a market winner. The risks associated with poor quality are so high, that retailers and consumers are increasingly prepared to pay more for higher quality. The high demands on quality, place constraints on the flexibility of the supply chain.

Based on the matrix of Mason-Jones, et al. [27], and the market winning factors cost and quality, the most effective supply chain operations strategy would be lean supply. We also have to take into account the nature of demand of poultry products. Fisher [281 makes a distinction between predictable and unpredictable demand. The demand for poultry products of end-consumers shows a very peaky pattern and seems unpredictable. This is explained by the heavy use of promotional activities at the retail level, which are not communicated in detail to Wings & Legs. If there were no promotional activities, demand would actually show a seasonal pattern, which would be predictable. The promotional activities initiated by the retailers place heavy strains on the upstream supply chain. An opportunity to level demand is to eliminate all promotional activities, but this encounters much resistance from the retailers; poultry products are a favorite for promotions to bring in new customers. Meat products are the most expensive components of evening meals, and a reduction in the price is attractive to consumers.

Also, the poultry processor itself initiates promotional activities. Mostly this is motivated by the need to sell over-production of products. Over-production of poultry products will always be the case, because the demand for the different poultry products is not equal or balanced, and the product structure of poultry is divergent. If there is a large demand for chicken wings, there should also be a demand for, for example, chicken legs and chicken breasts. One could argue that over-production should be stored to fulfil demand at a later time. Unfortunately, this is a limited possibility because of the perishability of fresh poultry products.

Furthermore, the supply chain is characterized by very short required lead times (retailers demand a delivery between 18 to 48 hours), frequent deliveries and increasing product variety; typical elements of an agile supply chain. The required service levels for poultry products are high and stock needs to be held at the poultry processor. The poultry processor has to comply with a minimal delivery reliability of 99 percent. The demand and market characteristics of the case company are summarized in Table 3.

Demand uncertainty is relatively high. As a result, the need for production capacity, and thus the need for raw materials (live chickens), fluctuates. The production capacity itself is fully utilized (to keep production costs per kg product as low as possible) resulting in very low production flexibility. Finally, the supply of (certified) chickens from (vertically integrated) suppliers has to be planned 12 weeks ahead because of the duration of the breeding and growing stages. Buffering is not possible in the supply chain since the quality of the supply (chickens) will deteriorate. Production planning and control is materialoriented with concern to the supply of chickens, is capacity-oriented with concern to production costs and is inventory-oriented concerning shelf life of (end) products. Production and supply are based on demand forecasts, which are unreliable given the market characteristics presented.

Most of the case characteristics point to a lean operations strategy for the poultry supply chain. However, the uncertainty of demand and the short required lead-times suggest that a part of the supply chain should be designed for agility. We will evaluate the opportunities for a leagile poultry supply chain. First, we will examine the possible positions of the PDP/CODP and the constraints (inherent to the processing of fresh products) that limit these possibilities. Second, the alternative strategic positions of the IDP are examined for the case supply chain.

The Strategic Location of the Material Decoupling Point

Before an analysis of the PDP/CODP can be made, customer or market specific attributes of the poultry product and the associated product differentiation processes have to be defined.

The end-consumer has the choice between several volume-variants at the outlet. For instance, he or she can choose between 4, 6 or 10 chicken legs in a package (3 product variants). Each retail outlet belongs to a larger retail-company. Each retailer has its own specific or private label and packed poultry products. So, the two-customer/market specific attributes that will be considered in this paper are, "retail-specific label-variant" and "consumer-specific volume-variant". Two production processes are related to these attributes:

The packaging process, at which a specific number of components (e.g. chicken legs) are combined into one package.

The labelling process, at which a retailerspecific label is printed and attached to each product.

The position of the PDP/CODP relative to these processes will be evaluated. Departing from the current position, two future positions will be analyzed. In Figure 3 these three positions are depicted. For each of these positions the possible benefits and limitations are explained. The objective of the re-positioning of the PDP/CODP is to increase supply chain flexibility to cope with relatively unpredictable demand and short required lead-times.

The Current Situation

The CODP does not coincide with the moment of product differentiation (PDP). The strategic inventory (the CODP) is located downstream of the two differentiation processes (packaging and labelling); the strategic inventory is customer/market specific and produced against forecast. The mix flexibility of this inventory is low and risk exists that products have to be re-packed and relabelled as actual demand for a specific product differs from the predicted demand. The costs incurred by re-packing and relabelling are high, because these activities require a considerable amount of manual labor. Using the concept of leagility, the packing and labelling process should be postponed as much as possible hence moved downstream. One could also say that the CODP has to move upstream. One way or another, the position of CODP and point of product differentiation have to coincide as much as possible.

Postpone Labelling

Here the labelling process has been postponed, downstream of the CODP at the poultry processor. Strategic inventory does not contain any retail-specific stockkeeping units. Hence, mix flexibility with respect to different retailers has increased. The risk of labelling the wrong amount of products for a specific retailer is eliminated. The labelling process is executed on demand, against real customer orders. The position of the CODP at this point is feasible. The throughput time of the labelling process is short, which creates the opportunity to delay it without exceeding the required lead time. Furthermore, the labelling process does not consume costly resources and a varying capacity utilization can be easily dealt with.

Postpone Packaging

It would seem that positioning the CODP before the packaging process (or postponing the packaging process) could increase the mix flexibility of the strategic inventory even more. But there are some constraints specific to the products and production process in the poultry industry, which make this position unfeasible. One of the main constraints is the perishability of the semi-finished products, and the requirements that stem from the trackability and traceability of products and batches in the production process.

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| Figure 3 |

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The processed semi-finished poultry products are perishable. This means that products can only be held in stock for a limited time span before they become nonconsumable, or obsolete. The vacuumpackaging of semi-finished components in very small batches extends the lifetime of these components. When these components are stored together in large batches (nonvacuum), quality deteriorates much faster and the risks of contamination increase. At this moment, the costs associated with advanced forms of meat-storage which do not have the above mentioned drawbacks are too high, compared to the costs associated with reduced mix-flexibility of strategic inventory. Quality and cost constraints also apply for the postponement of the packaging or labelling process further downstream, to the distribution center for instance. Furthermore, packaging of fresh poultry products at the distribution center requires an advanced production line in a low-temperature environment. This is only feasible if more fresh meat products are packaged at the distribution center (for reasons of economies of scale).

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| Figure 4 |

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The above evaluation of the position of the PDP/CODP shows that the most ideal situation would be that the PDP and the CODP coincide in the MDP. In this particular case, this is not possible due to quality requirements in the production process.

The Strategic Positions of the IDP

As stated before, the IDP concerns the most recent undistorted information about past sales. Downstream of the IDP each stage in the supply chain has the same view of marketplace demand, and is able to coordinate its distribution and production activities accordingly. The difference between IDP information and actual end consumer orders is important, as will be shown in the evaluation of two alternative positions of the IDP (see Figure 4).

Situation 1: The IDP is Positioned at the Poultry Processor

Information (EPOS data) of past sales of all retail outlets is grouped and sent to the poultry processor. The EPOS data is used by the poultry processor and the retail companies to control their distribution activities (high frequency deliveries of small batches to stock points at the distribution centers and retail outlets). Inventory is refilled to such a level that the next days' demand can be fulfilled, whereby the EPOS data is used as a forecast for future sales. This position of the IDP is commonly associated with the ECRconcept [29]. The undistorted exchange of EPOS data between retailer and producer enables the continuous replenishment of distribution centers and retail outlets. At the poultry processor the EPOS data can be used to schedule and control the packaging process.

Situation 2: The IDP is Positioned Upstream from the Poultry Processor

The IDP should be positioned as far upstream as possible [30]. Moving the IDP further upstream in the poultry supply chain increases the part of the supply chain that is geared towards demand pull. The EPOS data could also be used to time and synchronize the distribution processes between broiler houses and poultry processor, and the slaughtering/processing activities at the poultry processor. But, this is only possible if these processes actually can be synchronized. Synchronization is possible if cycle times, batch sizes and/or processing time are decreased or shortened. This is necessary because the pace of supply to the marketplace is a daily interval, once a day the distribution centers and retail-outlets are supplied. If EPOS data, which shows the variability of demand, is used to plan and control production processes downstream of the IDP, these processes have to be flexible and should be able to cope with varying capacity utilization, mix and volume variability.

Finally, information enrichment could extend the basic idea of the exchange of EPOS data, by including tactical information exchange with respect to promotional activities. Longer term information about future promotions, but also category management decisions at the retail outlet concerning the product assortment, can be characterized as tactical information. Transparency of this tactical information in the supply chain can increase the responsiveness of the supply chain. The concept of information enrichment at the operational level can be extended at this tactical level. In the literature this tactical level is supported by, for instance, the concept of collaborative planning, forecasting and replenishment [311. Furthermore, we state that feed-forward information (concerning production volumes, quality, etc.) going downstream the supply chain can also aid in the coordination process of the different supply chain stages.

Conclusion

Using the leagility and decoupling point concepts proves to be very helpful in the analyses of supply chains and in the identification process of innovative supply chain designs. However, because of specific characteristics of food supply chains the applicability of the concepts is restricted. The usefulness of IDP information, the position of the CODP and the choice of agile versus lean production depend on the possibilities of synchronization in the supply chain.

The relationships between the quality requirements of raw materials and products in the food industry and supply chain logistics are of uppermost importance, but have only been briefly addressed in management research. In the poultry supply chain, quality requirements limit flexibility. A more intensive collaboration between food technologists and operations management scientists could be worthwhile.

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| [Publication Image](http://www.logisticsmgmt.com/) |

**Right-shoring: New insights for the post-meltdown economy**

[*Richard Bergmann*](javascript:void(0);), [*Ganesan Ramachandran*](javascript:void(0);). [**Logistics Management (2002)**](http://proquest.umi.com/pqdweb?RQT=318&pmid=36260&TS=1291258076&clientId=29440&VInst=PROD&VName=PQD&VType=PQD). Highland Ranch: [Mar 2010](http://proquest.umi.com/pqdweb?RQT=572&VType=PQD&VName=PQD&VInst=PROD&pmid=36260&pcid=51167021&SrchMode=3&aid=1). Vol. 49, Iss. 3; pg. 34, 1 pgs

**Abstract (Summary)**

Is off-shoring still the best option given impending increases in freight rates, a renewed focus on sustainability, and ever-changing consumer needs? Two Accenture analysts say that the time has come for companies to reconsider their global supply chain strategies. This article presents a closer look at why and how to control the growing risks associated with global sourcing and procurement.

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| **Full Text**   (1616  words) |

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Is off-shoring still the best option given impending increases in freight rates, a renewed focus on sustainability, and ever-changing consumer needs? Two Accenture analysts say that the time has come for companies to reconsider their global supply chain strategies.

The economic downturn and a drop in crude oil prices produced an artificial window of opportunity for many companies as they continued expanding their global manufacturing footprint to off-shore locations. However, many high-performing organizations didn't follow along and continued focusing more on flexible manufacturing operations that blend off-shore, near-shore, and even on-shore facilities.

And as before, their network design decisions were guided most prominently by calculating "total cost to serve" for each customer segment and by the levels of service they deem most effective for each of those segments. In the post-recession economy, these companies are better poised to weather fluctuating oil prices and get an edge over their competitors. In fact, it is increasingly clear that most companies could benefit from a blend of off-shore, near-shore, and on-shore approaches. Following is a closer look at why and how to control the growing risks associated with global sourcing and procurement.

A dramatic decade

The decade of the 2000s marked a dramatic end to the commodities recession of 1980-2000. In 2008, the price of many commodities, notably oil and food, rose so high that real economic damage occurred, "stagflation" became a tangible threat, and the slowdown (or even temporary reversal) of globalization materialized as a real concern. At the same time, drops in U.S. GDP exceeded everyone's expectations quarter on quarter. The year also ushered in the worst recession in decades as consumer confidence slipped and U.S. purchasing hit an all-time low (Figure 1).

In parallel, crude oil prices dipped to $37 per barrel and the Deep Sea Freight Transportation Index dropped substantially (Figure 2). The lack of correlation between crude oil price changes and the deep sea freight index can be attributed to the demand-supply mismatches in the global freight volumes.

So, how did all this affect various firms' manufacturing strategies? A majority adopted classical approaches, such as ramping up scale economies, improving productivity, cutting back on manpower and raising their operational efficiency. The goal, of course, was to reduce costs and prices in order to remain viable. Many companies also became more reluctant to pursue new manufacturing strategies, because the recession's extent could not be known and conserving cash reserves was considered paramount. This often resulted in continued expansion of manufacturing operations to off-shore locations.

In the past six months, quite a few indications are that the global economy is trying to gain strength. Real gross domestic product of the United States increased at an annual rate of 2.2 percent in the third quarter of 2009, compared to a fall of 0.7 percent in the second quarter. As of this writing, oil prices are hovering around $80 per barrel, and analysts predict that $100 per barrel could be reached within the next few months.

The Conference Board Consumer Confidence Index, which had increased in November 2009, rose again in December. The Index stood at 56.5 in January (1985=100), up from 52.9 in December. The Expectations Index has increased to 75.6 from 70.3 in December 2009. Around the same time, an increase in deep sea freight rates went into effect. For example, Transpacific Eastbound Lane (TSA) carriers announced in December 2009 an "emergency revenue charge" that went into effect on January 15, 2010.

Past time for a new paradigm

With such positive indications-many indicative of impending higher shipping costs-the time has definitely come for companies to reconsider their manufacturing strategies. Is off-shoring really the best option, given the impending increase in freight rates, renewed focus on sustainability, and ever-changing consumer needs?

As noted in an earlier article published in Logistics Management ("Right-shoring: A flexible strategy for tough times"), the more sensible course may be for business executives to adopt an holistic "right-shoring" approach-positioning their global manufacturing operations in three, often-concurrent contexts:

1. On-shore : Manufacturing located on land masses closest to end customers (e.g., both manufacturing unit and most consumers located in North America).

2. Near-shore : Manufacturing located near end customers (e.g., manufacturing unit is in Latin America while the majority of consumers are in North America).

3. Off-shore : Manufacturing located far away from end customer base in order to take advantage of low-cost labor and/or less-expensive raw materials (e.g., manufacturing unit in China with a majority of consumers in North America).

This tripartite approach should not imply that companies aren't acknowledging the need to consider "total landed cost." However, several macro changes have occurred that raise the importance of a flexible manufacturing strategy that will likely include all three alternatives.

The most fundamental of these involves expectations about service. On the one hand, as more and more products become commodities, consumers are using service benchmarks such as delivery accuracy and post-sale responsiveness to make their choices. At the same time, basic assumptions about the relationship between service and cost are being challenged as demand remains weak and oil prices balloon.

For example, perhaps a particular level of service can no longer be guaranteed for a given price. Or maybe service expectations in general need to be lowered, even if corresponding price cuts do not follow. It all comes down to understanding total landed costs and the ongoing value and cost of service. More than ever, the right manufacturing option-or combination of options-stems from these two wellsprings as depicted in Figure 3.

Balancing the choices

When companies have to balance the service performance vis-à-vis the total landed cost, off-shoring may not be the only option for all product lines. In an increasing number of cases, near-shoring may be an ideal strategy for a particular product line.

Consider the case of a U.S.-based IT hardware manufacturer that embraced an off-shore manufacturing strategy in the early 2000s. The strategy worked well for a time. However, more and more North American companies started asking for shorter order cycles for their end customers. Labor costs at off-shore production sites began rising. Rising oil prices choked transportation networks with high freight costs. The cost of spares rose commensurately, while availability slipped. For all these reasons, the company is now considering a commodity-focused, near-shore manufacturing unit that will complement-not replace-the off-shore production center that will focus more narrowly on configure-to-order products.

On the other hand, if service performance is very important to the product but total landed cost is not, then on-shoring may be an appropriate option. A global consumer electronics firm that makes audio products and aftermarket car radio systems recently moved its manufacturing base back to North America.

The company had adopted a global manufacturing approach and tried to set up an off-shore production center in Asia-Pacific. However, significant quality issues-the result of local component sourcing problems and a dearth of assembly skills-sank the idea. The company then opted for a near-shore approach by opening up a center in Latin America. However, this too proved ineffective due to a dwindling cost advantage and security concerns. The company then moved its manufacturing operations to North America.

Sometimes, of course, service performance and total landed cost are equally critical and it becomes necessary for a company to adopt a strategy of postponement or to stockpile inventory if obsolescence is not a concern. For example, final assembly of foreign-made mobile phone batteries, circuits, cameras, and outer casings might be completed closer to the customer-thus simplifying customization and shortening the time needed to respond to market changes.

Still, when total landed cost is critical but service performance is not, then off-shoring may continue to remain the best option. A representative example might be in some aspects of the apparel industry-for product lines where styles change slowly and there are few fluctuations in consumer demand.

Lastly, there is another level-complexity management-that can sometimes challenge, or even transcend, cost and service concerns. For example, global aerospace companies have long operated design and manufacturing centers in off-shore locations to take advantage of low cost labor. However, the complexity of an engineering change order can often cause an off-shore contractor to incur delays of far greater length than those assumed by near- or on-shore subcontractors.

One such company was saddled with so many customers requiring frequent engineering changes that it was forced to re-examine its global manufacturing operating model eventually morphing from a pure-play off-shore manufacturing strategy to a mix of off-shore and near-shore. The company was thus able to avoid many long delays while allowing end customers to participate more fully in product prototype testing; and it still retained many of the cost advantages associated with off-shore manufacturing.

Flexibility is prudent

The global economy continues to evolve and new opportunities to reduce costs and penetrate new markets continue to present themselves. However, these opportunities can easily be offset by compromised service, management and engineering complexities and, most of all, the higher costs of fuel.

The reality is largely inarguable: In the near future, wild oil-price swings will continue. Longer term, steady price increases are a virtual certainty

All of the above influencers point to the same manufacturing conclusion: a right-shoring approach that strikes the most flexible possible balance among far-shore, near-shore, and on-shore resources. The new post-meltdown economy is rife with opportunity. But when service, pan-global collaboration, and total costs (including transportation, customs, taxes, security, control, and complexity) are factored in, it becomes increasingly clear that flexibility in the form of right-shoring is the prudent strategy.