Identifying the best supply chain model for a fashion apparel retail brand

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ABSTRACT

Supply chain is one of the key term in modern business world. Emphasis on supply chain has seen a vigorous change from being a supportive function to an integrated strategy within last couple of decades. It's a common belief in the business world that Brands are no longer competing but the supply chains.

Apparel & clothing is one of the biggest industries in the world. Clothing being a basic need of human, it's a never ceasing industry. Apparel retailing is a part of apparel supply chain. Very much like any other industry, apparel supply chain is a globalized and scattered supply chain. A cotton grown in India getting converted to yarns in Vietnam and the yarn sails all the way to far -East Asia which then becomes a fabric in China. This fabric then goes through the garment manufacturing process in Indonesia with trims made in Thailand. Then that garment goes to a shopping mall in Germany and an Australian traveler buys it. This is a typical supply chain in apparel. This gives us an image of how complicated the apparel supply chain and how complicated it is to manage apparel supply chain.

There are so many researches written based on studies of identifying optimum supply chain. There are numerous studies on the generic supply chain strategies and the applicability of those based on different aspects of the business. However there are very few researches written specifically on apparel business. Also though there are many researches which outline the generic supply chain, there's hardly anything which discuss about individual strategies and their applicability specifically for apparel retailing.

The attempt of this research is to identify the usage of the strategic elements in achieving the most effective supply chain. In order to do this, the research has carried out a thorough literature survey and focus group interviews while best practices of current best performing supply chains were studied in parallel. By gathering all the strategies concurrently through all the above routes, a questionnaire was created and the perception of the apparel industry professionals on the applicability of those strategies were analyzed through the questionnaire data.

So in summery the research identifies the most effective mix strategic elements for the supply chain model of an apparel retail fashion brand.

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INTRODUCTION

1.1 Background of the research

1.1.1 Introduction

Supply chain management is one of the most sought after topics in today's dynamic business environment which has grasp the attention of all the stakeholders. It is a concept and a process adopted by many organizations in different ways with the aim of improving the process efficiencies, quality, value addition, high customer satisfaction and competitive advantage over their competitors.

Supply chain management has evolved through different phases with new concepts and new finding allowing the businesses to grow further with improving the involvement of different stakeholders. In considering the objectives of the supply chain management, main objective is to improve customer value through proper management of activities across the organization. This mainly is done through successful information flow which ensure the correct strategy implementation across all the elements in the organization.

Concept of supply chain evolved following the logistics era. Around 1950s, logistics became a strategic concept with in organisations providing more importance. Following the emergence of logistic as a concept, around 1960s and 1970s study and practice of physical distribution and logistics took a more comprehensive turn with more knowledge sharing and acquiring. Concepts such as, demand forecasting, purchasing, requirement planning, production planning, manufacturing inventory, warehousing, materials handling, industrial packaging, finished goods inventory, distribution planning, order processing, transportation, customer service etc., came in to practice and acquired a more strategic position within the organization's planning activities. With business environment becoming more complex and dynamic many organisations started investing more on a smoother and efficient supply chain functions.

Background of this study is constructed on the strategic implication of the supply chain management in organisations, evaluating the concepts and strategies. Within this study researcher will evaluate the current supply chain initiative evolve around agile, lean and hybrid approaches.

Although the organisations balance themselves between different supply chain initiatives, there have hardly any evidence in identifying the correct mix of strategies based on the business circumstances. This research will continue to tap on to the strategic mix specially focusing on the apparel industry.

1.2 Problem statement

1.2.1 Research Gap

Supply chain management is a philosophy used by many organizations. Earlier the concept was simple. But as time evolved with business world getting more complex and dynamic organizations were looking for more result driven supply chain alternatives. These efforts resulted in different approaches and concepts proposed and tested by many companies working more closely with supply chain parties adding more value towards the end result which delivered to their customers.

Supply chain is an integrated process which involve bringing together different stakeholders with different skills, capabilities and strategies. Among the most common supply chain concepts and practices three commonly practice approaches can be identified as “Lean, Agile and Leagile”. Lean concept focuses on eliminating waste with a demand driven system. Lean is mostly about make to stock system purely prioritizing the demand ups and downs. In an agile supply chain initiative, flexibility given a more focus concentrating on an efficient response to unique customer demand. In Agile it is mostly the ‘wait and see’ approach where the commitment starts when the demand start responding in the market. Agile systems always focus on flexibility from lot sizes to production catering to the customer demands specifically.

With companies becoming more competitive and customer needs being complex and hard to please, companies couldn’t survive with just one product portfolio which can run with just a lean or with a complete agile approach.

This created a necessity to have a more flexible and broad strategy. So the concept hybrid approach was coined. This in fact is a mix of agility and leanness – leagile. Leagil focuses on several options which allow the companies to select between agile and lean approaches allowing a competitive edge in the market.

Although there can be many literatures on agile, lean and leagile which will be discussed descriptively in chapter 2, the question lies on the correct mixture of the two strategies. The mix can change based on the nature of the industry, based on the product line, based on demand, based on risk and many more other factors. Although researches talk about, different strategies to be adopted in achieving competitive advantage, the most suited strategic options for agile, lean and leagile have not been identified and the applicability of the selected strategies to the three generic strategies. Another gap in literature is the applicability for the apparel industry. No proper implications have been identified on the applicability of agile, lean and leagile for the apparel industry and on its supply chain.

1.3 Research problem

A problem can be defined as any situation where a gap exists between the actual and the desired ideal states (Sekaran, 2003). It can be either about, focusing on an existing problem in a current setting, or the quest for idealistic states in organizations. In identifying the research problem three areas have been considered by the researcher in terms of the supply chain concepts.

1. First is identifying the right mix between agile and lean. Although the hybrid approach is available for adoption by organizations, identifying the right mix will ensure the correct application which provides a more transparent approach to the company supply chain.
2. Second problem lies on the strategic application on agile, lean and leagile. The extent to which the strategic options effect the three generic strategies will ensure more effective strategy identification and implementation.
3. Third problem identification is industry specific. After identifying the correct mix and the strategic application, researcher will identify the specific relation of the correct mix and strategic application to the apparel industry.

1.4 Research objectives

This research is carried out with the purpose of identifying the correct mix and strategic implication of the supply chain concepts and aligning the finding towards the apparel industry. Researcher formulates below research objectives based on this research.

To identify the generic supply chain strategies used in companies in practical scenario

- Identify the strategic options practically related to those generic strategies
- Evaluate their applicability to apparel retail supply chains
- Formulate a supply chain model for a fashion apparel retailer brand

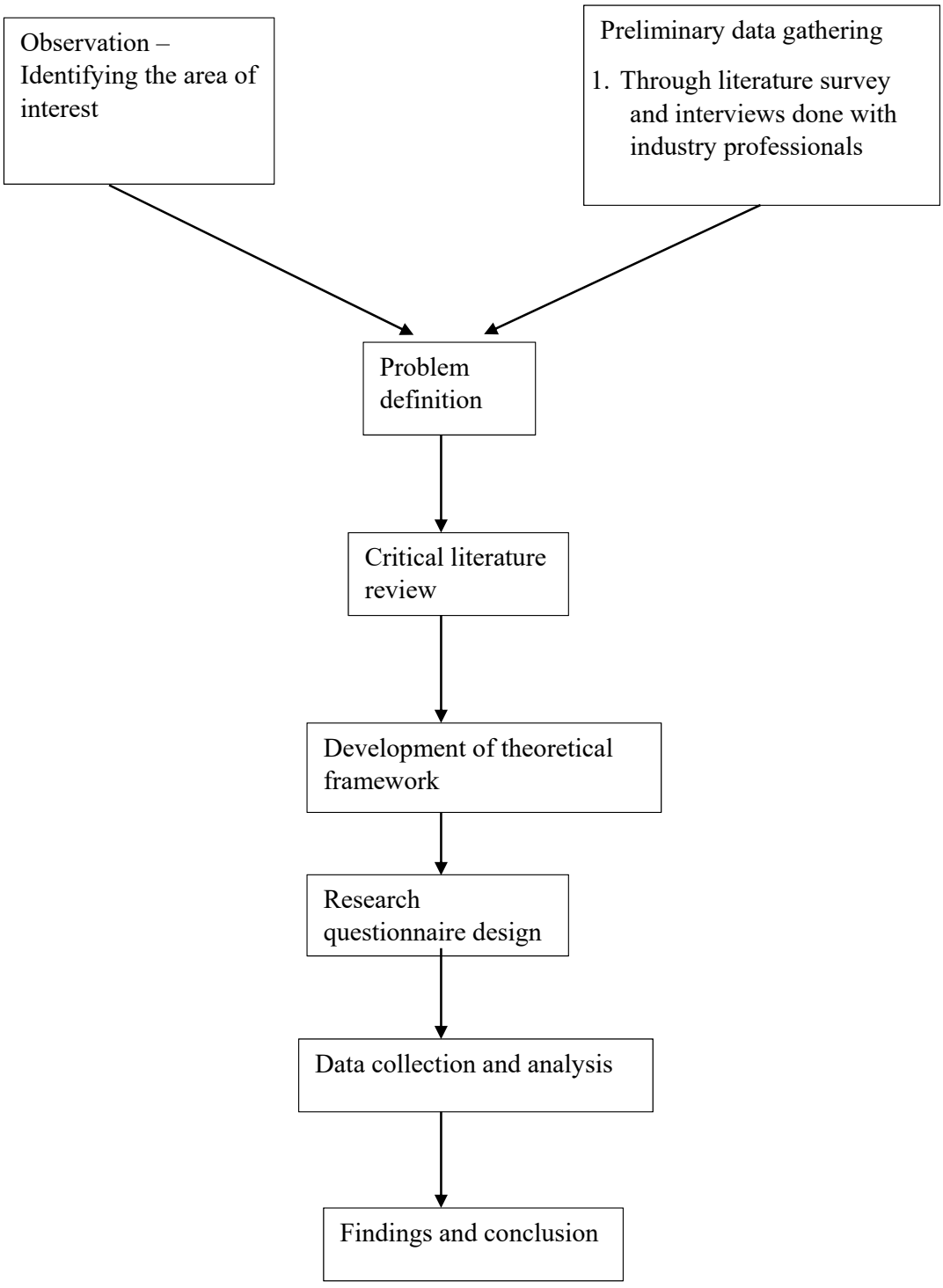
And further in achieving objectives, below actions to be followed in the execution steps.

- Identify the generic supply chain strategies used in companies in practical scenarios through academic literature
- Understand current supply related issues and problematic areas in apparel sector and identify potential solutions available
- Identify the best practices in retail apparel supply chain through studying the key players in the apparel industry
- Evaluate the implication of general strategic options specific to the apparel retail supply chain.
- To development of a potential supply chain model for the fashion apparel brands.

1.5 Research process

In the research problem, there are two broad approaches can be considered. One id deductive method and inductive method. In this research researcher uses the deductive approach which is depicted in the figure 1.1.

Figure 1.1 – Research process – Deductive approach



Initial problem screening was done through the basic literature study and discussions with industry professionals. Thereafter a critical literature was done. This was used to identify the context more and thus to create the research questionnaire in order receive the feedback to shape the final concept. This was followed by data analysis and findings.

1.6 Research scope

Scope of the research will focus on the researcher's choice of research question, objectives, variables, populations and methods of analysis based on theoretical perspectives and interpreting the findings of the data analysis. Within this research, researcher will identify the gap optimum supply chain solution and the correct mix with the relevant strategies proposed. Further researcher will align the findings of the data collection to apparel industry identifying the most suited supply chain mix.

Researcher will address the main distinguishing characteristics of scientific research identified as, Purposiveness, Rigor, Testability, Replicability, Precision and Confidence, Objectivity, Generalizability and Parsimony (Sekaran, 2003).

Purposiveness focuses on the goal or a purpose of the research, in this research researcher will drive the goals in identifying the optimum supply chain initiative and the mix referring to the apparel industry. Rigor refers to focusing on the theoretical frameworks and concepts relevant in conducting the research which will be discussed in detail in chapter 2, literature review with appropriate methodological implications. Researcher will provide evidence for the formulated hypothesis and framework based on the data collected in addressing the testability. This research finding will ensure the findings are consistent in addressing the fact of replicability, in other words, hypotheses will be supported reflecting the true state of affairs in the population. Precision refers to the closeness of the findings to reality based on a sample (Sekaran, 2003, p. 24). To ensure this researcher will collect data from three main sources such as questionnaire specifically addressed to the intendent recipients, discussion with industry professionals and through referring to published literature. Combined data collection methodologies will address the confidence in data collection, discussion and conclusions increasing the probability of findings. The research findings will solely be driven through unbiased data collection addressing objectivity characteristic and applying the research findings in to the apparel industry practices will generalize the

discussion. Lastly focusing on parsimony, researcher will identify the key determinants in identifying the optimum supply chain initiative and the mix allowing a more practical applicability.

1.7 Significance of the study

Findings of this research will be very significant for organisations in the apparel industry in identifying the correct balance between the strategic mix. Organizations require to understand the correct mix they are required to adopt between agile and lean. The study will point out the importance of both agile and lean practices based on different circumstance of product offerings, risk factor, market and environmental conditions, competition, competitor strategies etc.

Researcher will formulate the strategies mainly focusing on the apparel industry. The strategies will be identified with the appropriate mix and also the researcher will identify the practical implication based on industry best practices.

1.8 Time plan

Table 2.1 – Action Plan

Action	**Time frame**
Background study (Literature review and informal study)	April - May
Finalize research topic and scope	June
Critical literature review	June - July
Semi structured focus group interviews	July - August
Financial data analysis	August - September
Development of research questionnaire	October –November
Data gathering and analysis	December – January
Discussion of research findings and report writing	January- February
Submission	End February

1.9 Chapter breakdown

Chapter 1: Introduction

Introduction chapter includes, background of the research, the research gap and the problem identification. Through the problem identification researcher has explained the objectives of the research, scope and the research process, which is the deductive approach. With highlighting the significance, researcher has included the time plan proposed for the research

Chapter 2: Literature review

Following the introductory chapter, literature review chapter will identify the key concepts, key terms and frameworks relevant to the research which provides a base for the framework and hypothesis.

Chapter 3: Research methodology

Methodology chapter will identify the proposed methodology. Researcher will focus on the data collection methodologies, sample identification, questionnaire development, identifying respondents with in the chapter three.

Chapter 4: Research findings and data analysis

Within the chapter 4 researcher will discuss the findings pertaining to the followed methodologies in line with the framework and hypothesis. Discussion will analyses the findings focusing in fulfilling the research objectives.

Chapter 5: Conclusions and future research directions

In the final chapter, researcher will collate the findings of the study and derive at conclusions. Concussion will include identification of the practical scenario focusing on the managerial and theoretical implications which lead the study in to achieving the final outcome or the objective. Lastly, the researcher will discuss the future research in this final chapter.

Chapter 2

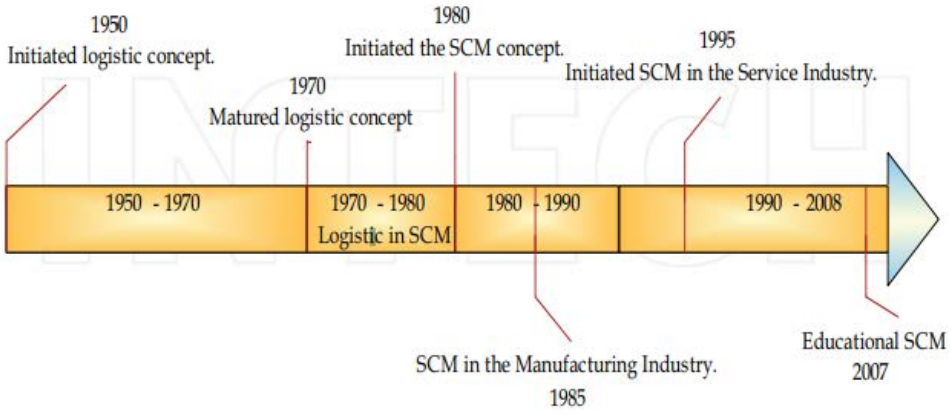
LITERATURE REVIEW

2.1 Evolution of supply chain management

Supply chain had evolved through different phases till present. According to Heskett et al., the importance of logistics increased considerably, when physical distribution management in manufacturing firms was recognized as a separate organizational function (as cited in Habib, 2011, p. 8). New supply chains may emerge as a result of technological breakthrough (Lee and Cheng, 2013), the emergence of a new product or market niche (Hahn,2015), or new geographical markets (Russo et al., 2012) and also referring to the studies carried out by Fritz (2014) and Wang et al (2015) concept of SCM can decline when demand is insufficient for that particular product or service (as cited in MacCarthy, Blome, Olhager, Srai, & Zhao, 2016, pp. 1696-1697

In early 1980s, SCM, became one of the most popular concepts within management (La Londe, as cited in Habib, 2011, p. 8)). Drucker identifies the importance of the concept of supply chain management as, “One of the most significant changes in paradigm of modern business management is that individual businesses no longer compete as solely autonomous entities, but rather as supply chains. Business management has entered the era of inter-network competition and the ultimate success of a single business will depend on management’s ability to integrate the company’s intricate network of business relationships” (as cited in Habib, 2011, p. 8). Figure 2.1 depicts the evolution of SCM over the years and at present SCM has become a crucial concept which contributes towards the organizational competitive position in the market.

Figure 2.1 – Stages of supply chain evolution



Source: Habib, M (2011), Supply Chain Management (SCM): Theory and Evolution,

Supply chain has a life cycle of emergence, growth, maturity and decline. Supply chain life cycle stats at the initial phase at the start which becomes the emerging stage where different technological options and supply chain options will be experimented. Growth stage is characterized by rapidly growing use of the supply chain with improvements in the performance and stability of supply chain processes and their enabling technologies. Supply chain will reach its maturity when demand achieves a consistent level where the supply chain changes enabling a strong and reliable supply chain processes with relatively small changes. In some situations, organisations will get access to relatively mature supply chains through mergers, acquisitions or through strategic outsourcing. Declining supply chains will result in due to market shrinkage or new supply chains substituting existing supply chains (MacCarthy, Blome, Olhager, Srai, & Zhao, 2016, p. 170)

2.2 What is supply chain

The term supply chain has been identified and defined in different aspects by different professionals. Christopher (1998) viewed supply chain as the network of entities that involve in upstream and downstream processes which creates value to the customer in the form of product and services (as cited in Teng & Jaramillo, 2006).

Krajewski and Ritzman (2001) has interpreted the supply chain through a material flow perspective as the set of linkages between suppliers and materials and services that spans the transformation of raw materials into product and services (as cited in Teng & Jaramillo, 2006).

According to Mentzer, et al., (2001) in his work on defining Supply Chain Management has defined Supply chain as three of more entities directly involved in the upstream and downstream flow of products and services, finances and or information from a source to a customer. The importance of this is it discusses about the aspect of information flow as a key point in supply chain.

In their detailed study it further discussed about 3 levels of supply chain channel existence and the relationships as direct supply chain, extended supply chain and ultimate supply chain. Further an interesting point to highlight is that they presented Supply Chain as a Phenomenon in business environment which implied the fact that a supply chain exists in any business whether it is necessarily managed or not.

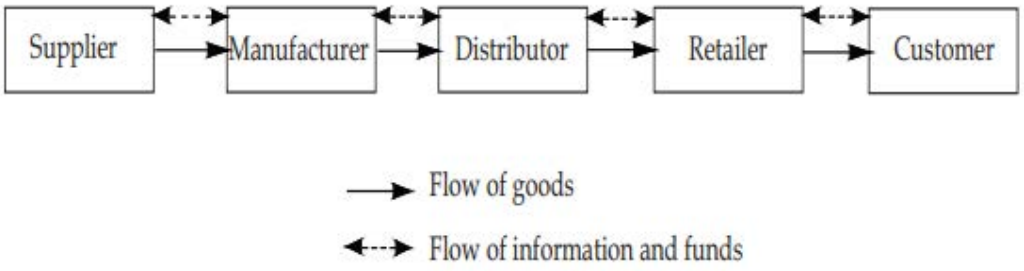
Simatupang and Sridharan (2005) proposed an instrument to measure the extent of collaboration in a supply chain consisting of two members, suppliers and retailers. They have proposed a model and arrived at an index that incorporates three dimensions of collaborative practices, namely information sharing, decision synchronization and incentive alignment. The interdependencies among these dimensions are not taken into consideration. Karuranga et al. (2008) proposed a model of SCC using structural equations modeling for Quebec forest product companies. Stank et al. (2001) developed a measurement method that considers both internal and external collaborative practices. Vereecke and Muylle (2006) have considered the relationships with both the suppliers and customers in their method of measuring supply chain collaboration. By using system-wide revenues and costs, Ramdas and Spekman (2000) examined collaborative practices between high performers among innovative-product supply chains and high performers among functional-product supply chains (Anbanandam, Banwet, & Shankar, 2011)

2.3 Supply Chain Management

In identifying the supply chain management identifying the correct definition is crucial. According to the researches done by Hugo, Badenhorst-Weiss & Van Biljon (2011), Hilletofth (2009), Shukla, Garg and Agarwal (2011), supply chain management can be defined as a set of approaches that efficiently integrate and coordinate the material, information and financial flows. In other words, supply chain can be identified as a processes from the initial raw materials to final consumption of the finished products linking across supplier-user industries. (American Production and Inventory Control Society (APICS), 1990)

Supply chain includes suppliers, manufacturers, distributors, retailers, and customers. The customers are the main focus as the purpose of every business is to satisfy their customer needs, in the process of generating profit for itself (Chopra and Meindl as cited in Habib, 2011, p. 4). Figure 2.1 dipicts the the flow of inforation and good with in an organisational basic supply chain.

Figure 2.2 – Basic supply chain



Source: Chopra, S. and Meindl, P. (2001) as cited in Habib, 2011, Supply Chain Management (SCM): Theory and Evolution

While the Physical flows involve transformation, movement, and storage of goods and materials, information flows allow the various supply chain partners to coordinate and control the day-to-day flow of goods and material up and down the supply chain. In analysing the physical flow, it can be identified as a crucial element where bottlenecks and wastage are easily reflected and it is crucial part of the supply chain which needs managing.

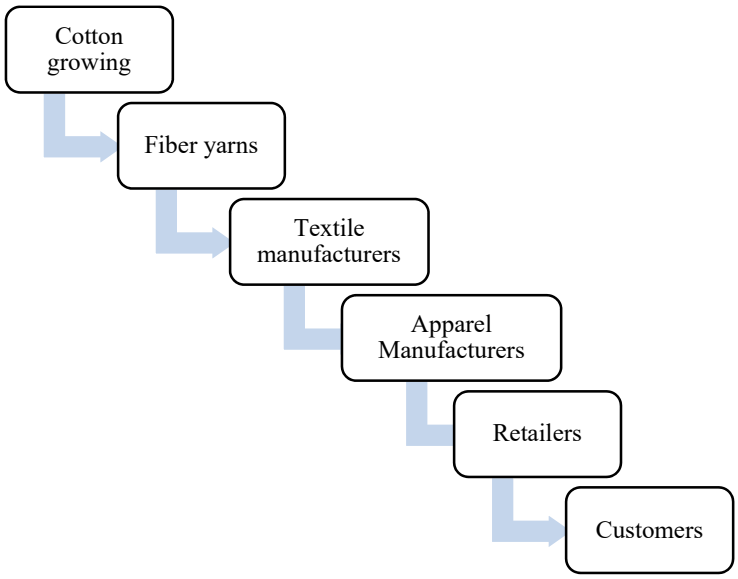
In discussing the supply chain as a phenomenon, and on the importance of Supply chain management, Mentzer et al (2001) viewed it in 3 main areas, a management philosophy, an implementation of a management philosophy and a set of management processes and they discussed in detail about management approaches through those distinctive routes. Supply Chain management gives a key emphasis on relationship management in which they further discussed about the right structure and equations of managing the relationships through the channels in the most productive manner (Maqsood & Akintoye, 2002).

In summary SCM can be interpreted as identifying the existence of the processes and the information flow through the channels in the upstream and downstream supply chain and managing the relationships with the channel members objectively to gain a sustainable competitive advantage over competition.

2.4 Supply chain in apparel industry

The clothing industry has been one of the most enduring in history and has been an important step on the route to industrialization in many economies (Barrientos et al., 2010; MacCarthy and Jayarathne, 2012 as cited in MacCarthy, Blome, Olhager, Srai, & Zhao, 2016). Characteristics of the textile and apparel industry can be identified as, increased competition, short product life cycles, long production cycles and increased fragmentation, which make it difficult to match supply with demand (Chaudhry & Hodge, 2012, p. 65). The synchronization of activities through the distribution channel requires detailed planning and analysis with the high competition in the market (Teng & Jaramillo, 2006, p. 45). Figure 2.3, depicts the basic supply chain model for the textile industry.

Figure 2.3 – Basic supply chain model in the textile/ apparel industry



Source: Teng, S. G., & Jaramillo, H. (2005). A model for evaluation and selection of suppliers in global textile.

Supply chain depends on successful stakeholder relationships. According to Masson et al, global apparel industry showed that relationships between fashion retailers and their intermediaries might be collaborative, but relationships between intermediaries and small garment manufacturers were mostly adversarial (as caited in Chen & Fung, 2013, p. 303). Apparel supply chain utilizes a combination of different suply chain startegies. In early days most organisations have applied sourcing strategies utilizing low-cost supply markets (Taplin, 2006; Stengg, 2001, as cited in Åkesson, Jonsson, & Edanius-Hällås, 2007, p. 740)

Textiles provide the major input to the clothing industry, creating vertical linkages between the two industries, forming a supply chain. A supply chain is defined as the network of retailers, distributors, transporters, storage facilities and suppliers that participate in the sale, delivery and production of a particular product (Wheelen, 2004). Looking at the textile and apparel manufacturing, it can be identified that it is increasingly integrated through vertical supply chains that involve distribution and sales activities, sourcing raw materials via design and production to distribution and marketing with integrated production network where the production is sliced into specialized activities located at strategic locations focusing on high contribution with high value addition to the end product (Nordas as cited in Berdine, Parrish, Cassill, Oxenham, & Jones, 2008, p. 3).

When the apparel supply chain is considered at a nation level, it is driven by textile and apparel manufacturers as well as retailers. Different organisations use variety of sourcing strategies. For example, different retailers have established their own buying offices overseas to handle the outsourcing of their product while other companies utilize sourcing agents to manage elements of the sourcing process (Berdine, Parrish, Cassill, Oxenham, & Jones, 2008, p. 4). Another strategy used by organisations with global operations is to use foreign suppliers mainly for cost reasons but as they gain the extensive international experience organisations will extend their focus on to areas such as quality, delivery, flexibility and technology with the involvement of foreign sourcing suppliers (Swamidass, as cited in Berdine, Parrish, Cassill, Oxenham, & Jones, 2008, p. 4).

2.5 Supply chain management strategy

In today's complex business world, companies are continuously pushed towards pursuing rapid innovations (Carillo and Franza as cited in Hilletofth, 2012, p. 1274). In idnetifying reasons, one is the continuously shortening product life cycles (Zacharia, 2001), and other reason is that the ability of organisations to charge higher initial prices on first-to-market products resulting in a dominant market position with lesser lead times (Drogeetal.,2000) which allows companies to have their focus on rapid and innovative new product development (Hilletofth, 2012, p. 1274)

In addressing the environmental factors supply chain strategies plays a pivotal element in today's complex business environment. It integrates with the marketing strategy, customers' needs, the product strategy, and power position (Hugo et al., 2011, Hines, 2006, Klemencic, 2006, as cited in Ambe, 2012). Strategies exist, whether they are planned or not. In other words, all organisations have a de facto strategy, to be effective, an organization's supply chain strategy must align with its competitive strategy (Chopra & Meindl, 2010, as cited in Ambe, 2012).

2.6. Generic supply chain strategies

According to the intensive researches done by Hull, 2000, Simons & Zokaei, 2005, Hallgren & Olhager, 2009, Pandey & Garg, 2009, Vinodh, Sundararaj & Devadasan, 2009, there are two generic strategies in supply chain management, namely lean and agile strategies (Ambe, 2012). In most of the companies supply chain design (SCD) field has

centered on the ability of the supply chain to be either “lean” (Womack and Jones, 1996) or “agile” (Goldman et al., 1995, as cited in Hilletofth, 2012. P. 1275).

Leanness refers to “developing a value stream to eliminate all waste, including time, and to enable a level schedule”, while “agility means using market knowledge and a virtual corporation to exploit profitable opportunities in a volatile marketplace” (Manson-Jones et al., 2000, as cited in Ambe, 2012). In other words, the essential difference between lean supply chains and agile supply chain is that, while lean focus primarily on efficiency and agile supply chains focus primarily on effectiveness or responsiveness.

2.6.1 Lean

According to Womack & Jones, Lean is a supply chain term defined as the ‘enhancement of value by the elimination of waste’ (as cited in Ambe, 2012). A lean supply chain is concerned with cost reduction by operating the basic processes with a minimum of waste (Qi et al., 2009, as cited in Ambe, 2012).). Initially lean was only adopted in production, but after 1990 concept was gradually extended to supply and distribution processes (Hines et al., as cited in Perez, Castro, Simons, & Gimenez, 2010, p. 56).

The primary objective of a lean supply chain can be realised by using the most basic forms of data communication on inventories, capacities, and delivery plans and fluctuations within the framework of just-in-time (JIT) principles (Amir, 2011, El-Tawy & Gallear, as cited in Ambe, 2012). The main principles in lean supply chain evolves around eliminating waste, reduce non-value adding activities and operations, and improve the value addition (Wee & Wu, 2009, p. 336). According to Macduffie and Helper, Waste” is defined as anything that interferes with the smooth flow of production (as cited in Wee & Wu, 2009, p. 336). According to the studies done by Monden, 1998 and Liker, 2004, main waste types include, overproduction, waiting, conveyance, over processing, excess inventory, movement, defects and unused employee creativity (as cited in Wee & Wu, 2009, p. 336).

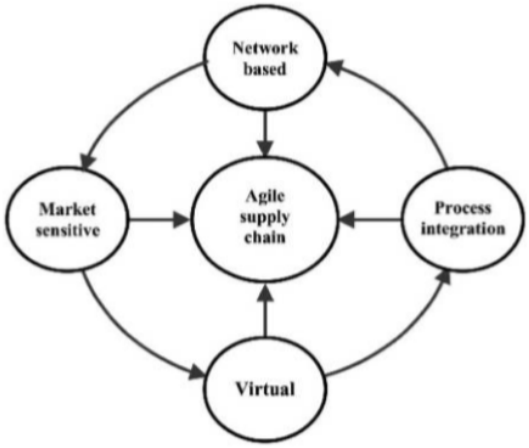
Among the key features of a lean supply chain strategy identified are predictable market demand, a lowest-price criterion, product supply based on forecasts, a long product life cycle, and long order lead time (Gattorna, as cited in Ambe, 2012). Further according to Cox et al. lean approach will only succed for products which operate in chains characterized

by regularity, high volume and standardized demand, for example, the automobile industry, the chemical industry, the food retail industry, the aerospace industry (as cited in Perez, Castro, Simons, & Gimenez, 2010, p. 56). Main outcomes of lean strategies result in improve quality, reduce costs and improve service to customers as traditional batch and queue mass production and supply chain approaches are transformed (Larson and Greenwood, as cited in Mollenkopf, Stolze, Tate, & Ueltschy, 2010, p. 15). The application of the lean concept enables to reduce the logistic costs, generally by eliminating any loss in the supply chain (so called muda), It could be the designing of efficient operations, the reduction of stocks levels, the flow time's reduction, lower use of resources, lower employment, and elimination of doubled without added value actions (2010). But over the years it has become difficult to implement and sustain as lea supply chain practices with the increased complexity and length of supply chains (Mollenkopf, Stolze, Tate, & Ueltschy, 2010, p. 15).

2.6.2 Agile

Agility responses to the challenges from the dynamic business world. The main objectives of agility are based on competition, business practice, corporate structures in the 21st century, strategic response, adaptability, building defenses against competitors, a paradigm shift, a step towards innovation, and the promise of a business world based around cooperation (El-Tawy & Gallear, as cited in Ambe, 2012). Main characteristic of an agile supply chains the ability to respond quickly and efficiently to a volatile marketplace, the reduced lead time, which dramatically affects the dynamic response characteristic of a supply chain (Sharma & Bhat, 2013, p. 202). The key characteristics can be illustrated as below.

Figure 2.4 – Key characteristics of agile supply chain



Source: Christopher, M. (2000). The Agile Supply Chain : Competing in Volatile Markets.

This provides a chance for agility to become an appropriate strategy, when coping with turbulence and reconfiguring operations to enable individual customer specifications to be accommodated in high-volume manufacturing. According to Baker that agility not only responds to changing market conditions, but also to exploiting changing opportunities with high responsive capabilities (as cited in Ambe, 2012). The agility is especially important when product life cycles become shorter, market demands change more rapidly and the demand becomes more sensitive (Konecka, 2010). Further Konecka (2010) identified that the best way to satisfy more demanding clients' lower risk of lost orders and too slow response is agility in the supply chain.

Although there are many advantages in agility it has been criticised for, lacking in human integration and repetitive manufacturing (Hines, Holweg & Rich, Duarte & Machado, as cited in Ambe, 2012). As a result, many prefer an agile supply chain strategy or a combination of both strategies.

Referring to different literature, seven major agile supply chain enablers which are described as below (Sharma & Bhat, 2013, p. 203).

2.6.2.1 Build-to-order

Build-to-order is the capability to quickly build standard or mass-customized products on receipt of the orders without forecast, inventory or purchasing delays which will be shipped directly to individual customers,to stores or dealersor (Sharma & Bhat, 2013, p. 204).

2.6.2.2. Market sensitivity

According to Agarwal et al. (2007) deployment of agile supply chains depends on market sensitively and accuracy of data (as cited in Sharma & Bhat, 2013, p. 204). One crucial charcateristic for market-oriented business is being close to the customers. Closeness with customer helps in getting data quickly and accurately that ultimately leads into quick production (Sharma & Bhat, 2013, p. 204)

2.6.2.3. Felxibility

Flexibility is the degree to which the firm is able to adjust the time in which it can ship or receive goods (Sharma & Bhat, 2013). As idneified by Swafford et al organizational processes flexibility (procurement, manufacturing and distribution) is a key antecedent of SCA data, where manufacturers adopt flexible practices (external and internal flexibility) to cope with uncertainty and turbulence in marketplace (Zhang et al., as cited in Sharma & Bhat, 2013, p. 204).

2.6.2.4.Adaptability

The agile supply chains has evolved over time as with economic chnages, political shifts, demographic trends and technological advances reshape markets. An adaptable supply chain adjusts the supply chain design to meet structural shifts in markets, modify supply network to strategies, products and technologies (Lee, as cited in Sharma & Bhat, 2013, p. 204) Companies that adapt supply chains when they modify strategies often succeed in launching new products and breaking in to new markets (Sharma & Bhat, 2013, p. 204) .

2.6.2.5. Collaborative

Agile supply chain require organizations to maintain close and coordinated relationships with their major business partners such as suppliers, manufacturers and distribution (Ngaietal, as cited in Sharma & Bhat, 2013, p. 204). Teams that work collaboratively can obtain greater resources, recognition and reward when facing competition for finite resources (Sharma & Bhat, 2013, p. 204).

2.6.2.6. Virtual integration

"The agile supply chain is virtual in the sense that it is connected and integrated through shared information on real demand so that all the players in the chain, from the manufacturers to the customers, are all working to the same set of numbers" (Sharma & Bhat, 2013). Agile supply chain evolves by integrating different parties and functions along the value chain through a set of operational, management and technological competencies (Ngai etal., as cited in Sharma & Bhat, 2013, p. 205).

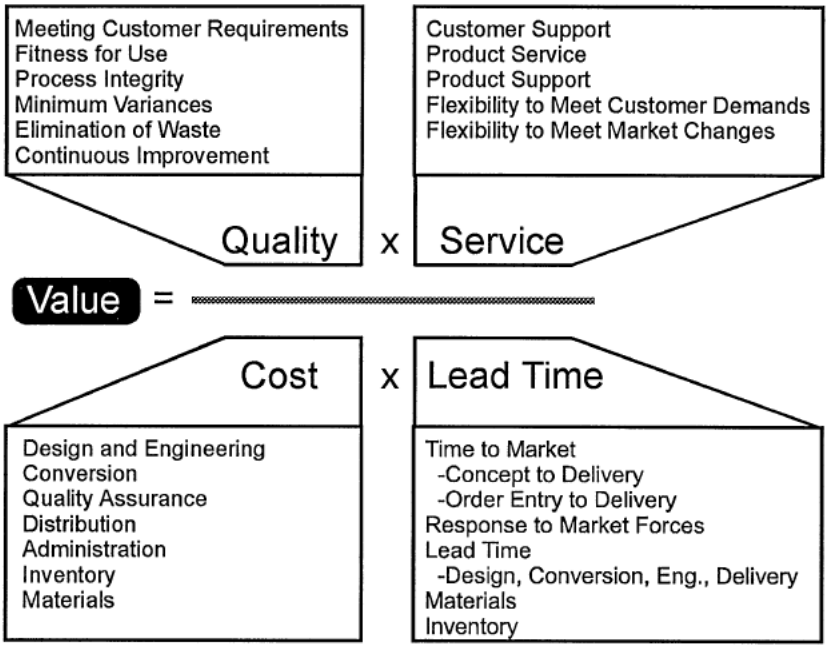
2.6.2.7. Network based

A distinguishing feature of agile companies is their use of flexible arrangements with a wide supply base. This idea of the supply chain as partners linked together as a network provides an important ingredient of agility (Sharma & Bhat, 2013, p. 205). With growing era of technology, the competitive advantage lies with organizations who can better structure, coordinate and manage the relationships with their partners in a network committed to better, closer and more agile relationships with their final customers.

2.6.3. Legality

Naylor, Naim, & Berry (1999) Highlights the fact that the two key paradigms lean and agile can be integrated to the total supply chains. They discuss in detail about the concept of de-coupling points and the importance of de-coupling points to distinct lean or agile strategy. Further they highlight the importance of total value creation rather than focus on one aspect as a strategy and how legality can be utilized to attain this.

Figure 2.5 – Basic supply chain model in the textile/ apparel industry



Source: Naylor, J. B., Naim, M. M., & Berry, D. (1999). Leagility: Integrating the lean and agile manufacturing paradigms.

Christopher and Towill, (2001) analysed that both the agile and the lean approach and tried to combine them for greater effect. The focus in their paper lies on the creation of hybrid strategies to develop cost-effective supply chains. They suggest an integrated manufacture/logistics model to enable the essential infrastructure. In this model there are included various components, which can be used for the purpose of this work, the development of the time efficient supply chain model.

2.7 Comparison between lean and agile

The above two segments discussed about two different strategies or in other words paradigms separately. It is important to understand the differences of the two in relation to each strategic aspect. (Konecka, 2010) tried to differentiate the two along the strategic aspects. It shows that some of them are clearly distinctive and some have slight differences in the approach.

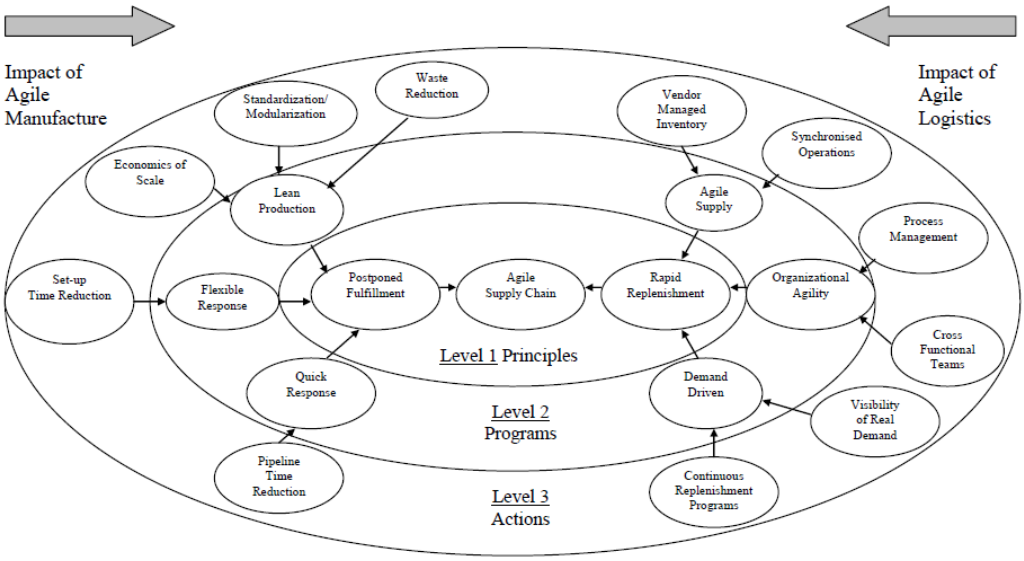
Table 2.1 – Agile lean comparison

Supply chain characteristics	**Lean**	**Agile**
superior objective	meet the foreseeable demand in the most efficient and therefore the cheapest way	respond quickly to changes in demand in order to reduce the shortage of supply, price reductions and obsolescence of goods
market success factors	quality, total delivery time, availability	quality, cost, total delivery time
the most important element of competitive advantage	cost	availability
the strategy in the orders' area	to shorten the cycle of the fulfillment of the orders and if it possible, without increasing costs	boldly invest in methods to reduce the cycle of the fulfilment of the orders.
suppliers' selection strategy	the superior criteria for selection should be the price and quality	the superior criteria for selection should be speed, flexibility and quality
stocks keeping strategy	to shorten the cycle of the inventory rotation and to minimize the stock levels in whole supply chain	to allocate the important buffer stock of semi-and final products
strategy in the area of product designing	To design products regarding the cost reduction and increasing of production productivity	to use the modular designing to postpone the phase of the diversification of the product
production strategy	To keep high level of production capacity utilization	to keep the surplus of buffer production capacity

Source : Konecka, S. (2010). Lean and Agile Supply chain management concepts in the aspect of risk management.

Although the two concepts have laid out their circumstances often there will be situations where a combination of the two maybe appropriate i.e. a hybrid strategy. Hybrid supply chain strategies will consider a mixed portfolio of products and markets there will be some products where demand is stable and predictable and some where the converse is true (Christopher, The Agile Supply Chain : Competing in Volatile Markets, 2000).

Figure 2.6 – Integrative model for enabling the supply chain



Source: Christopher, M., & Towill, D. (2001). An Integrated Model for the Design of Agile Supply Chains.

2.8. Formulating the right supply chain strategy

A supply chain strategy specifies how a firm will achieve its competitive advantages through its supply chain capabilities, such as cost efficiency, response speed and flexibility (Ismail & Sharifi, 2006: 436) as cited by (Ambe, 2012) . A supply chain strategy also specifies how the manufacturing, purchasing, marketing, and logistics functions work together to support the desired competitive strategy (Qi, Zhao & Sheu, 2011: 372) as cited by (Ambe, 2012).

There are many research papers which discuss about finding the right supply chain strategy. They have generally outlined the suitability of lean agile or leagile concepts based on the business context. Different researches have taken different approaches in categorizing this.

The three most important determinants of the functioning and the development of global (as the most popular) supply chains are: the product's characteristics, the nature of the demand and the total replenishment time (Christopher, Towill 2002).

(Ambe, 2012) also has discussed in detail about the factors which moulds the supply chain strategy for a company. He groups them in to 3 main groups as

- The characteristics of the product
- The manufacturing characteristics
- Decision drivers of supply chains

Fisher (1997) argues the supply chain should be shaped based on the product demand and on the focus on customer service. He accepts the fact that product life cycle, demand predictability, product variety, market standards for lead times and service are important. However, he emphasizes the fact that all of them will finally be replicated on to demand patterns. So key is demand of the product type.

2.9. Factors to consider when identifying the right supply chain

As discussed above, many researches have been driven in identifying the factors when selecting the right supply chain strategy and the supply chain instruments. However, all those are driven through the key words of Product and service types, market dynamics, product demand, supply chain structure etc. and most of them are discussing a common array of factors though termed differently in some cases as below,

1. Business environment/customer
2. Characteristics of the product
3. Manufacturing characteristics
4. Decision drivers of supply chains

2.9.1 Customer /Business environment

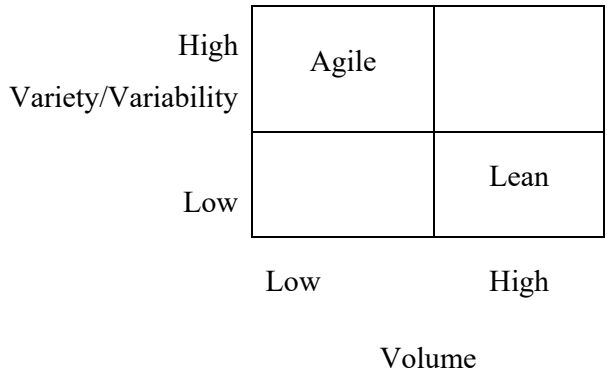
2.9.1.1. The customer product variety

With the globalization and due to the extraordinary development of Information Technology, people are more informed about the products and services they buy and therefore, they are more demanding too. This creates the market more dynamic and more variety of products and substitutes. For an organisation to choose the right type of supply chain strategy, it must understand the customer and the supply chain uncertainty (Ambe, 2012) as cited in Hines, 2006: 57; Chopra & Meindl, 2010: 41. Also (Ambe, 2012) discuss about six key market variables that determine the attributes of a supply chain structure: volume; time; variety; service level required; price; and rate of change, innovation, and new product development as cited by Hines, 2006: 58.

As identified by (Christopher, The Agile Supply Chain : Competing in Volatile Markets, 2000), figure matrix depicts how the agile and lean supply chain is used based on circumstances. Three critical dimensions have been listed through which the supply chain strategy can be established or in other words in determining between lean and agile approach.

1. Variety
2. Variability (or predictability)
3. Volume

Figure 2.7 – Lean or Agile



"Agility" is needed in less predictable environments where demand is volatile and the requirement for variety is high

"Lean" works at best in high volume, low variety and predictable environments

Source: Christopher, M. (2000). The Agile Supply Chain: Competing in Volatile Markets.

2.9.1.1.1. Reducing complexities

As identified Christopher (2000), one of the biggest barriers to agility is the continuous complexity of business operations and one main reason for this is the product and brand proliferation. Further evolution of organisational structures and management processes have also been contributing towards organisational complexity (p.18).

In discussing on the product complexity, major priority should be given for marketing and logistics human capital combination. Product complexity includes not only design issues (e.g. the number of non-standard components in a product) but also excessive variety which doesn't act like a contributing factor of consumer value (Christopher, 2000).

In identifying the complexity through organisation structures and management processes, high emphasis is given for Business Process Re-engineering (BPR) which highlight the need to reduce or eliminate the many non-value activities that are inherent in traditional functionally-based business. Breaking down functional silos and re-grouping around value-creating processes will help reduce organisational complexity (Christopher, 2000)..

Another contributing factor for complexity reduction enhancing agility, is the development of a human resource strategy that leads to multi-skilling and encourages cross-functional working. Team-based management has been demonstrated to be a highly effective facilitator of organisational agility (Christopher, 2000, p. 19).

2.9.1.1.2. Material and product standardization

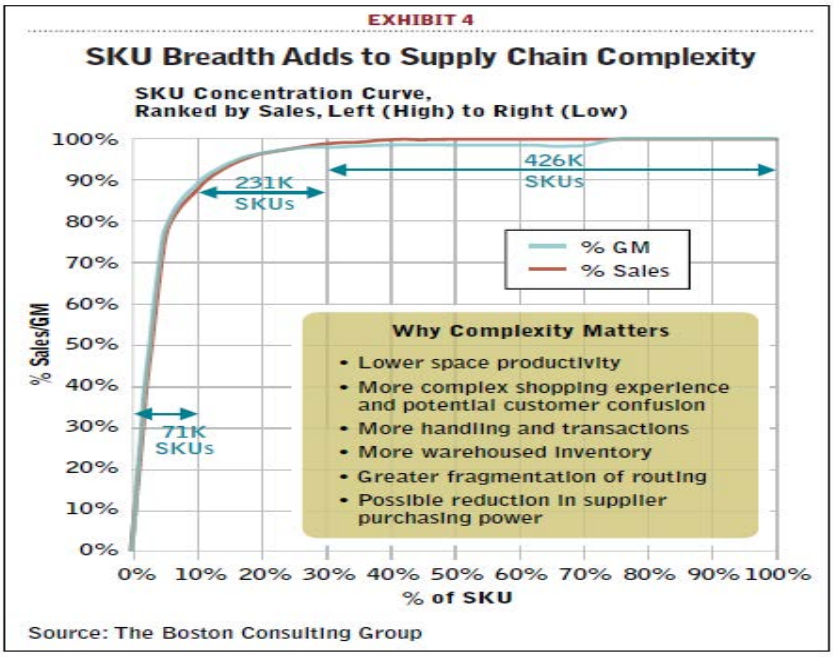
Material standardization is one of the key strategies which is in use across many industries. Being a key pillar of both "lean" and "Agile" concepts material standardisation gains its focus for business operations depending on different product types and complexities (Naylor, Naim, & Berry, 1999). According to Jayaram and Vickery general definition on standardization can be identified as, "the use of standard procedures, materials, parts, and/or processes in designing and manufacturing a product" (Sánchez-Rodríguez, Hemsworth, Martínez-Lorente, & Clavel, 2006, p. 57). It is about having key shapes and

thus maintaining a lesser number of SKU s. Also this will reduce the amount of work in terms of pattern developments, control, consistency etc.

With increasing number of competitors rate of new products has increased overtime and as a result many companies have turned or tried to turn traditionally functional products into innovative products (Fisher, 1997, p. 110). Identifying the concept of ideal supply chain, Fisher further introduced the “hour glass” concept which focused on the too many options at development/production but less in execution and sales. It is a discussion on how long customer is willing to wait against the difference.

Further according to Mercier, Sirkin, & Bratton (2010), gross margin and sales will have a saturation point beyond which that will become flat irrespective of how many options put in to the market.

Figure 2.8 – SKU Breadth against sales and margin yield

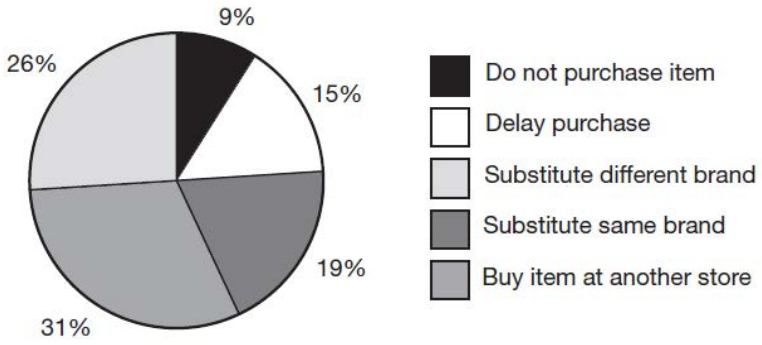


Source: Mercier, P., Sirkin, H., & Bratton, J. (2010, January/February). 8 Ways to Boost Supply Chain Agility.

According to the graph, a firm can reach 90% of possible margin from 10% of SKU (product options). The point to take here is product standardization /material standardization helps a company achieve with maintaining a simplified range but making almost the same revenue but from supply chain side will be much simpler a productive to manage.

Further (Christopher, 2011) has presented an analysis of how customers will behave in a stock out situation in a shop. This also confirms that stock out is not a fatal situation and can still manage,

Figure 2.9 – Shopper behaviour when faced with stock out



Source: Christopher, M. (2011). Logistics & Supply chain management

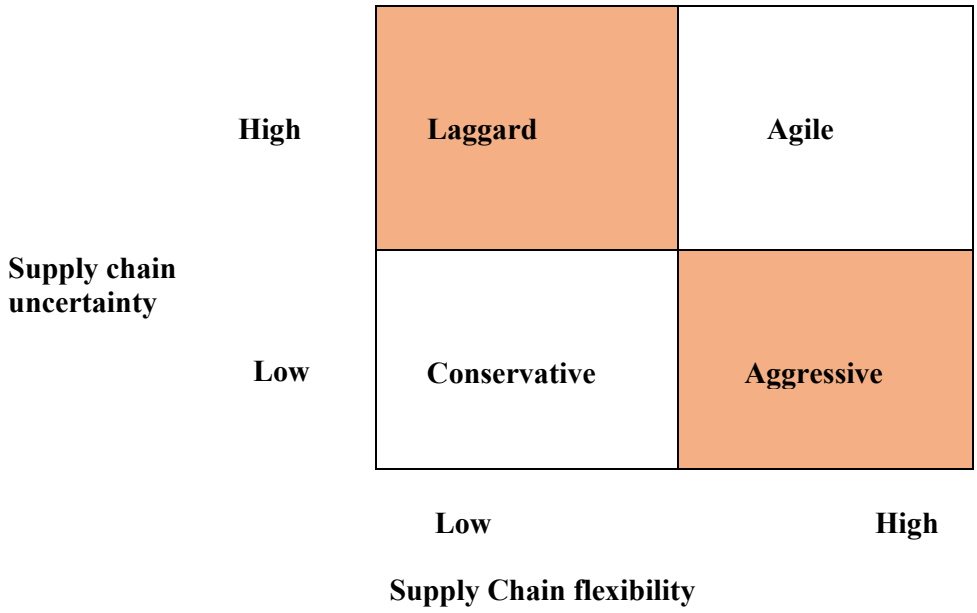
2.9.1.2 Environmental uncertainty

Business environment is another key aspects which affects to shape the supply chain strategy. (Yi, Ngai, & Moon, 2011) Identifies two key questions which drives the decision to determine the right supply chain strategy.

1. What is the relationship between flexibility strategies and environmental uncertainties in the supply chain context?
2. How can supply chain responsiveness be improved in today's fast-moving environment?

Further this research has identified strategic tools in certain environment conditions and has categorized the strategic approaches in matrix.

Figure 2.10 – Basic supply chain



Source: Author adopted from Yi, C. Y., Ngai, E., & Moon, K.-L. (2011). Supply chain flexibility in an uncertain environment: exploratory finding from five case studies.

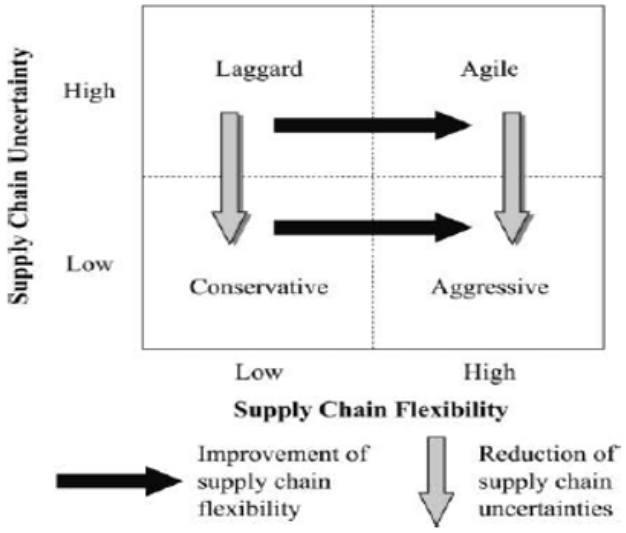
The research further discussed about the operational strategies related to each segment in the matrix

Table 2.2 - Operational strategies

Strategy	Operational
Conservative (A lean approach)	Focus on cost efficiency. Maintain the same organization structure and supply chain relationships. Continuous process improvements.
Agile	Effective formulation of business alliances to support fast response.
Aggressive	An approach where the uncertainties are identified as risks and opportunities and formulate strategies to capitalize on the opportunities in a cooperative manner with the supply chain partners.
Laggard	This is not the best strategy to be in unless for a specific downsize or close down intention

Source : Author adopted from Yi, C. Y., Ngai, E., & Moon, K.-L. (2011). Supply chain flexibility in an uncertain environment: exploratory finding from five case studies.

Figure 2.11 – Conceptual framework for improving supply chain responsiveness



Source - Yi, C. Y., Ngai, E., & Moon, K.-L. (2011). Supply chain flexibility in an uncertain environment: exploratory finding from five case studies.

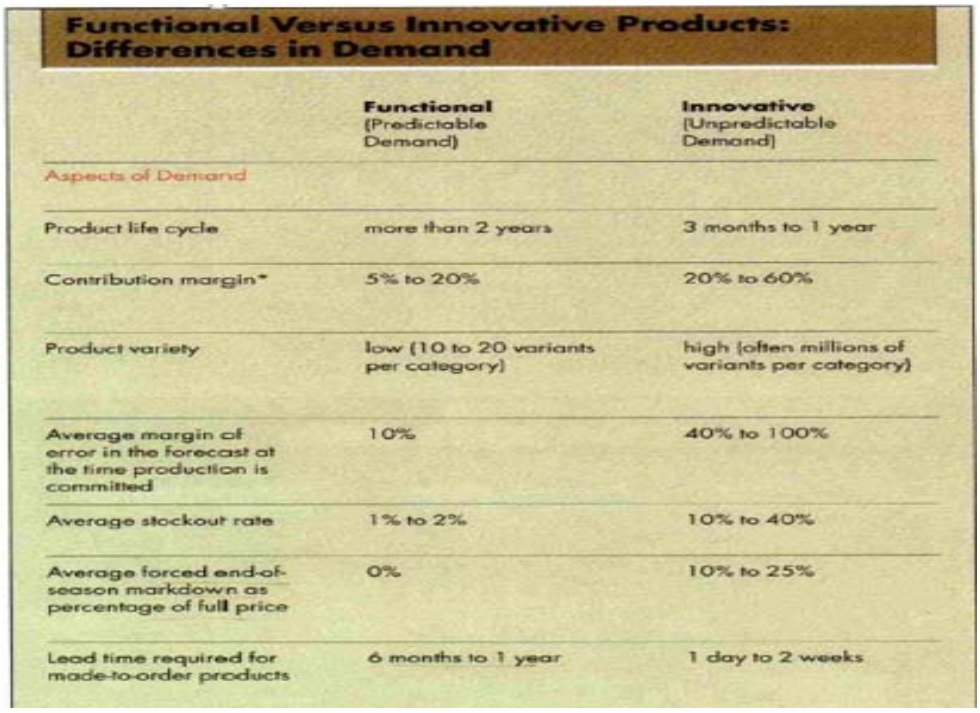
2.9.2 Product type/functionality

Most of the researches have tried to identify the supply chain strategy through the product type and the functionality.

Fisher (1997) argues the supply chain should be shaped based on the product demand and on the focus on customer service. He accepts the fact that product life cycle, demand predictability, product variety, market standards for lead times and service are important. However, he emphasizes the fact that all of them will finally be replicated on to demand patterns. So key is demand of the product type.

In this exercise he has segregated the products as Functional and Innovative products and he has differentiated characteristics for those two so that different generic strategies can be followed.

Figure 2.12 – Functional Vs innovative product demand differences



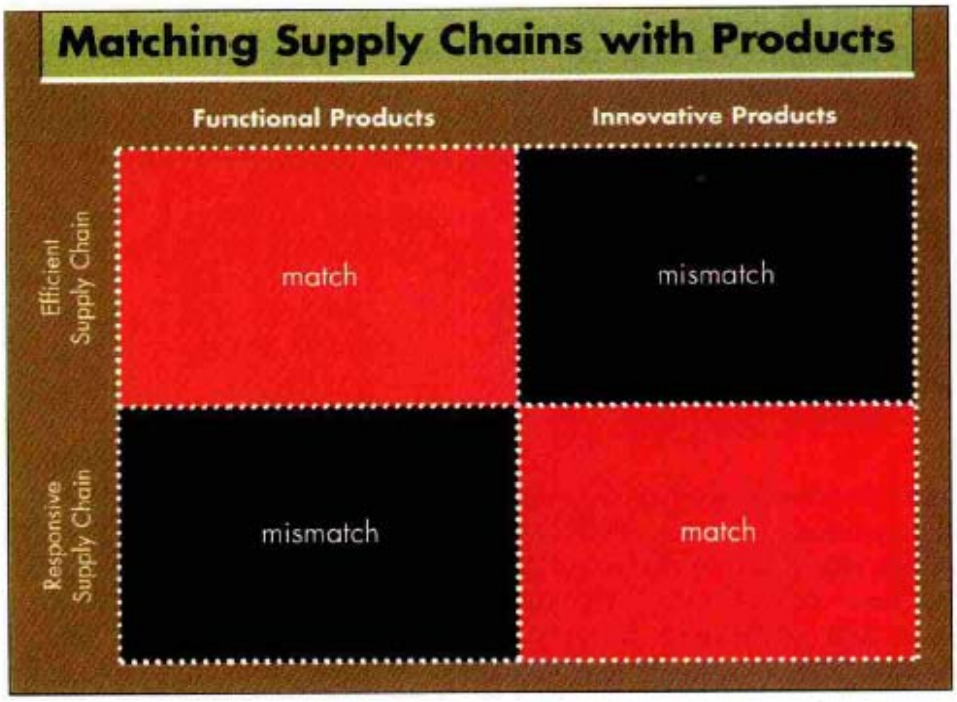
Functional Versus Innovative Products: Differences in Demand

Aspects of Demand	**Functional** (Predictable Demand)	**Innovative** (Unpredictable Demand)
Product life cycle	more than 2 years	3 months to 1 year
Contribution margin*	5% to 20%	20% to 60%
Product variety	low (10 to 20 variants per category)	high (often millions of variants per category)
Average margin of error in the forecast at the time production is committed	10%	40% to 100%
Average stockout rate	1% to 2%	10% to 40%
Average forced end-of-season markdown as percentage of full price	0%	10% to 25%
Lead time required for made-to-order products	6 months to 1 year	1 day to 2 weeks

Source **:** Fisher, M. L. (1997, March- April). What is the right supply chain for your product

Further fisher has brought in a conceptual framework to identify strategies according to product demand /type characteristics. The below chart highlights if Lean or agile strategy suits well for the particular product type.

Figure 2.13 – Suitability of the supply chain strategy based on product type/ demand



Source : Fisher, M. L. (1997, March- April). What is the right supply chain for your product

2.9.2.1 Product life cycle

PLC has been identified as another key aspect in identifying the supply chain strategy. However, this is another element of product demand.

Purvis, Gosling, & Naim (2014) Summarizes some research work done by venderembse et al. (2006) through empirical case studies and some other previous researches as below

Table 2.3 – supply chain strategy based on PLC

Product type	PLC stage	Strategy
Basic products	Introduction	Lean
	Maturity	Lean
	Decline	Lean
Fashion/ Innovative	Introduction	Agile
	Maturity	Lean
	Decline	Lean
Mix (mix of basic and fashion)	Introduction	Leagile
	Maturity	Leagile
	Decline	Leagile

Source: Purvis, L., Gosling, J., & Naim, M. N. (2014). The development of a lean, agile and legile supply network taxanomy based on differing types of flexibility

It may be difficult to know which strategy to use in a supply chain, but product life cycle (PLC) theory can help managers identify which strategies to use during different phases of the product cycle (PLC) summarises all the steps from the product design and development phases to the decision to remove it from the market. The product goes through an introduction, growth, maturity and a declining phase (Ambe, 2012) originally cited by (Aitken, Childerhouse & Towill, 2003: 135; Fawcett *et al*., 2007: 228; Astrom & Ohgren, 2010: 21).

Figure 2.14 –Supply chain strategy linked to product life cycle

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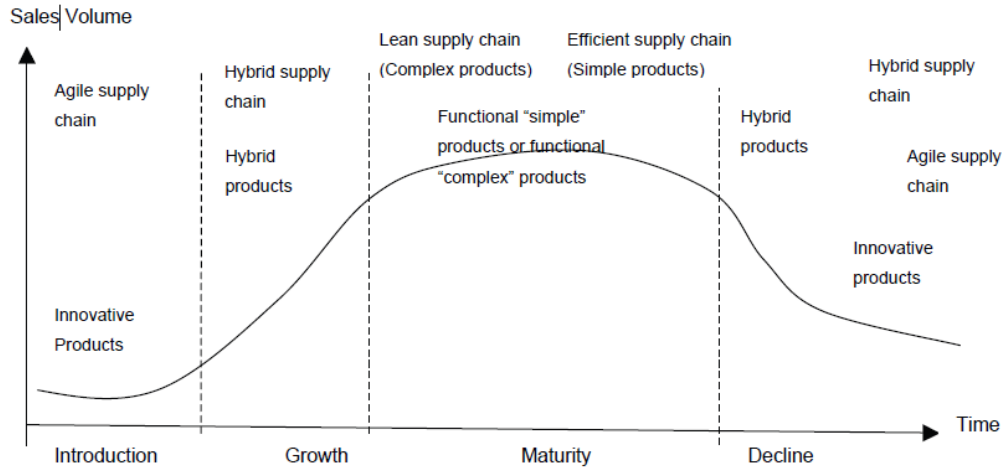


Source: Ambe, I. M. (2012). Determining of Optimum Supply Chain Strategy.

2.9.2.2. Market winners and market qualifiers

Ambe (2012) in his research work with reference to previous work from (Christopher & Towill, 2002), (Astrom & Ohgren, 2010) and Jacobs et al. (2009) has highlighted the concept of order winners and qualifiers to align the generic supply chain strategy.

The concept of 'order qualifiers' and 'order winners' advocates the basis on which manufacturing strategies to choose Order qualifiers are the primary requirement to position a brand in a competitive arena, while order winners refer to the specific capabilities that an organisation has to actually win orders.

The concept of order qualifiers and order winners leads to the derivation of an appropriate manufacturing strategy qualifiers are the basic criteria that permit a firm's product to be considered as a candidate for purchase by customers; while order winners are the criteria that win an order through differentiation.

The connection between these ideas of 'qualifiers' and 'winners' and 'lean' and 'agile' is critical. At its simplest the lean paradigm is most powerful when the winning criteria is cost; however, when service and customer value enhancement are prime requirements for market winning then the likelihood is that agility will become the critical dimension (Christopher & Towill, 2001)

Figure 2.15 –Order winners and order qualifiers

Source - Christopher & Towill, (2001) An Integrated Model for the Design of Agile Supply Chains

2.9.3 Manufacturing characteristics

2.9.3.1 Manufacturing process

Manufacturing process also have been identified as a key aspect to decide which strategy to be used to manage the supply chain. (Ambe, 2012) has complied a concept through the previous researches done by Jacobs et al. (2009) and Stavrulaki & Davis, (2010) on how manufacturing process can be aligned with business strategy and firm positioning.

The research discuss about four common types of manufacturing structures include the job shop, batch process, line flow process, and continuous process (Ambe, 2012) as originally cited by (Jacobs *et al*., 2009: 206; Bowersox, Closs & Cooper, 2010: 86; Stavrulaki & Davis, 2010: 129),

• Job shop process: Job shop products are typically customised for a specific customer.

• Batch process: products that are similar in processing requirements are produced.

• Line flow process: in line processes, products with similar variations are typically used on assembly lines through various stages of production. Processes or components are added at each stage.

• Continuous process: These are similar to assembly lines (line flow processes) in that the product follows a predetermined sequence of steps, but here the flow is continuous

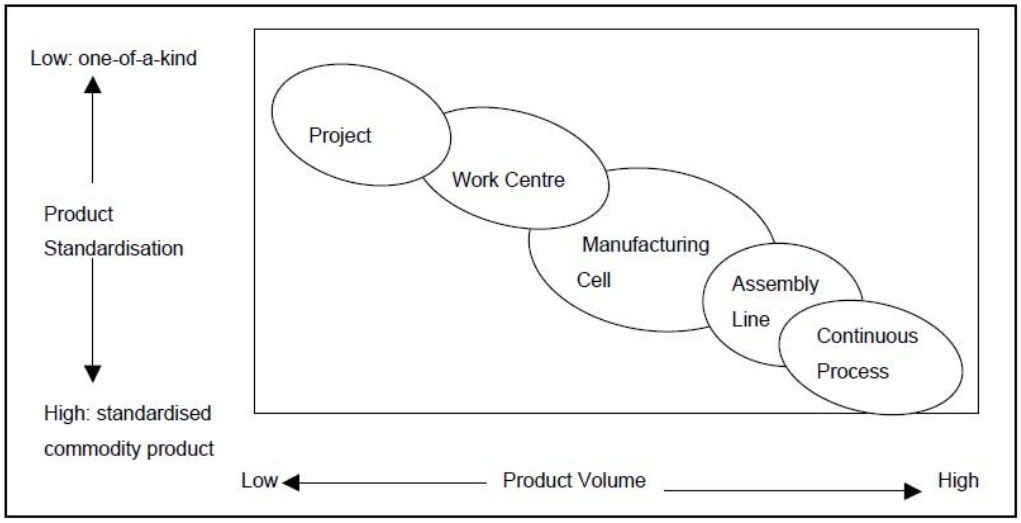
According to the processing route the complexity (standardization) and volume changes. This can be related to the generic Lean and Agile strategies.

- Standardized high volume manufacturing process – Lean suits best

- Customer specific low volume processes – Agile concept suits best

Below is a graphical representation of this.

Figure 2.16 –Product –process matrix: framework describing layout strategies



Source: (Ambe, 2012)

2.9.3.2 Manufacturing techniques

This is again an extension of the previous discussion however this leads to a complicated concept of having the right mix of lean and agility.

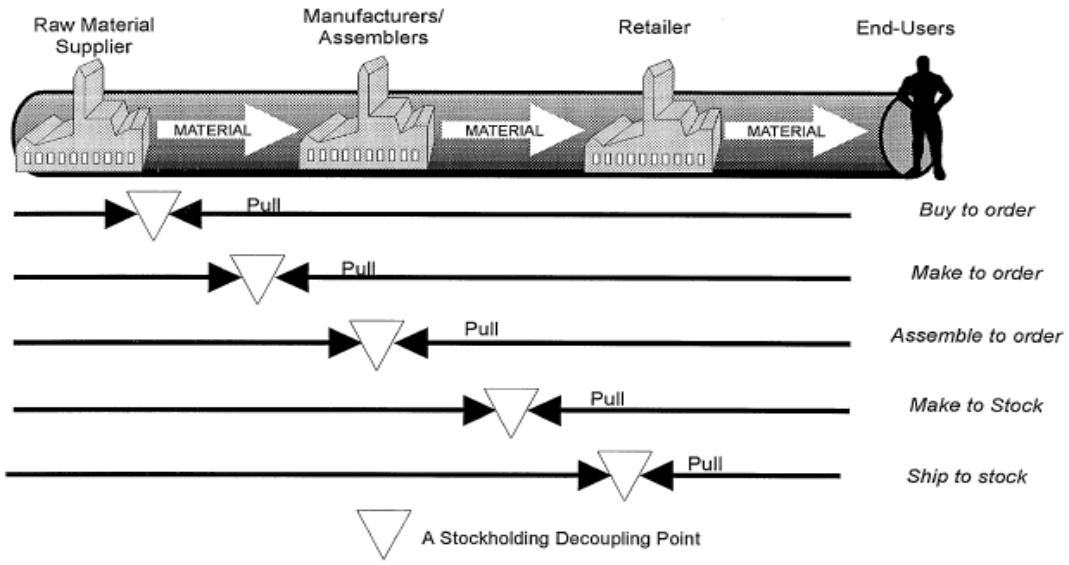
(Naylor, Naim, & Berry, 1999) discuss this concept in details. They discuss about different manufacturing techniques which differs at the decoupling point or in other words at the point where the general stock is held.

Table 2.4 – Manufacturing techniques

Manufacturing technique	Suitability
Buy to order (BTO)	For unique products which customer specific configuration. Very high lead times
Make to order (MTO)	Main raw materials are generic however the product configuration is customer specific. Comparatively low since the base material is common
Assemble to order (ATO)	This is also about same concept but the final differentiation/customization is postponed to latest of the manufacturing segment
Make to stock (MTO)	This discuss about a very standardized product. It can manage different demands in various locations.
Ship to stock (STO)	This is the most generic and restricted manufacturing strategy where the supply chain needs predict the correct volumes for the specific market as well.

Source - Naylor, J. B., Naim, M. M., & Berry, D. (1999). Leagility: Integrating the lean and agile manufacturing paradigms.

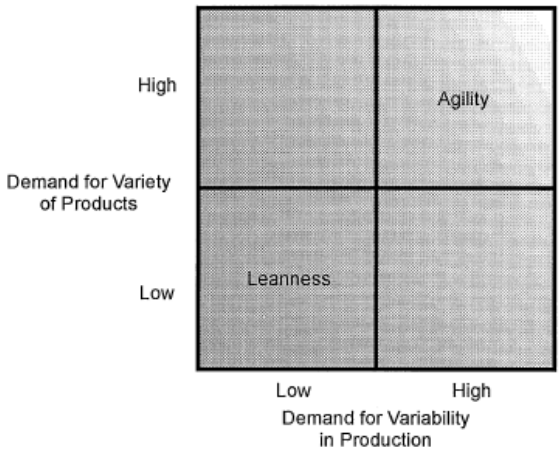
Figure 2.17 –Manufacturing techniques



Source - Naylor, J. B., Naim, M. M., & Berry, D. (1999). Leagility: Integrating the lean and agile manufacturing paradigms.

The concept is that LEAN paradigm can be applied to supply chain upstream above the decoupling point and downstream from the decoupling point will need an AGILE strategy (Naylor, Naim, & Berry, 1999)

Figure 2.18 – Lean and Agile



Source - Naylor, J. B., Naim, M. M., & Berry, D. (1999). Leagility: Integrating the lean and agile manufacturing paradigms.

2.9.3.3. Production process

This is another way of identifying the correct supply chain strategy. There are two main cycles of production strategy in a manufacturing environment,

1. Mass production
2. Mass customisation.

Mass production relies heavily on a company's ability to accurately forecast demand. These forecasts guide the organisation's decision regarding operations and production .Mass production is built towards forecast-driven production and employs a lean supply chain strategy, while mass customisation is built towards customer-driven production and employs an agile supply chain strategy (Ambe, 2012) as originally cited by (Zhang & Chen, 2006: 668).

2.9.4 Decision drivers of supply chain

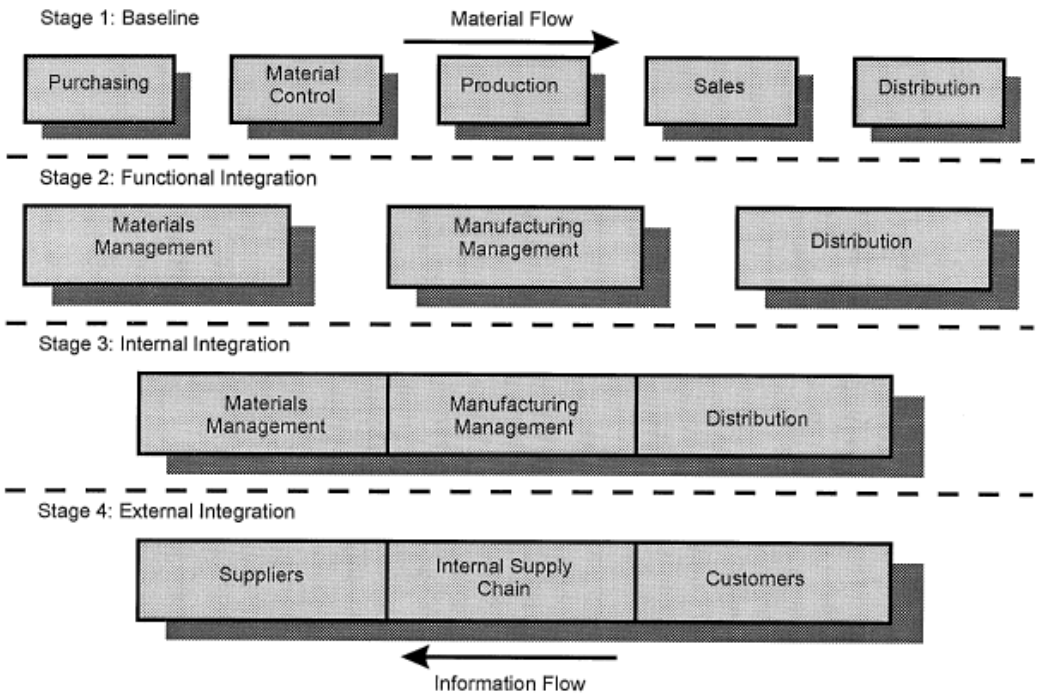
SCM emphasises the relationships between partners in the supply chain, integrating activities from the supplier to the customer while adding value, maximising profitability through efficiency, and achieving satisfaction (Ambe, 2012) as cited in (Sayuti, 2011: 287). Effective supply chain management calls for an understanding of each driver and how it operates. Decision drivers directly affect the supply chain strategic choice. (Ambe, 2012) has identified 9 key decision drive the changes in supply chain strategy

1. Integration
2. Collaborative relationships
3. Information technology
4. Production/facilities
5. Inventory decisions
6. Sourcing decisions
7. Location decisions
8. Transportation
9. Pricing.

2.9.4.1 Supplier integration

Supply chain integration is a key feature irrespective in any supply chain. Integrated supply chain focus on meeting the end customer requirement by removing boundaries among the supply chain partners. (Naylor, Naim, & Berry, 1999).

Figure 2.19 – Information and material flow



Source - Naylor, J. B., Naim, M. M., & Berry, D. (1999). Leagility: Integrating the lean and agile manufacturing paradigms.

Ambe (2012) has concluded relationship of Lean and agile paradigms to the relation of supply chain integration. He identifies that the integration process for an agile supply chain should be more rapid than that of a lean supply chain and specially, the key enabler for an agile supply chain is the integration of business partners to enable a rapid response to changing and fragmented markets.

As identified by Cao, Zhang, ManTo, & Ng, (2008), supply chain coordination encompasses every effort of information exchange and integration during the courses of developing, producing and delivering a product or service to end marketplaces. In practical situations, all the parties involved in the supply chain will have different objectives and conflicts. This create a situation where it is crucial to achieve the all-level consensus, through which different members along a supply chain can react to market requirements in highly congruous ways

- Type I - Vertical integration

Vertical integration refers to the process in which steps of production and/or distribution of a product are controlled by a single company or functional entities of an enterprise, in order to increase that company's or entity's power, mainly in terms of cost or time efficiency, in the marketplace. Expansion toward downstream activities is referred to as forward integration, and that toward upstream is referred to as backward integration (Cao, Zhang, ManTo, & Ng, 2008). Further as per observations by Elram (1991), vertical integration could be viewed as a conventional form of SCM, (as cited in Cao, Zhang, ManTo, & Ng, 2008).

- Type II – Coordination practices in efficiency oriented chain

In a traditional textile-apparel supply chain, brand owners often play the role as key coordinators, for example, as distributors or retailers. Most of the cases, brand owners have their own design teams and specify their registered design requirement, while the garment manufacturing processes are subcontracted out external parties. This is done mainly through orders to transfer information between different supply chain members (Cao, Zhang, ManTo, & Ng, 2008).

Bullwhip effect can be identified as the direct result of such kind of operation. Leanness is the insistent requirement from globalizing competitions to enhance efficiency. Supply chain parties should try to eliminate all the waste of the whole chain through technical and managerial methods to be lean which creates an efficiency oriented supply chain (Cao, Zhang, ManTo, & Ng, 2008).

- Type III - Coordination practice in 3P-hub (third party as the hub) chain

Coordination practice in 3P-hub chain (third party as the hub) refers to the whole supply chain to provide the finished goods to their customers – brand owners, like a hub. Generally, the trade agents do not have their own manufacturing factories, but they will help the apparel retailers to choose suppliers and organize the production, quality control and design. They will rely on their core competence which are procurement network and good capability of coordination (Cao, Zhang, ManTo, & Ng, 2008).

Figure 2.20 – Operational structure of a brand who works through 3rd party hub

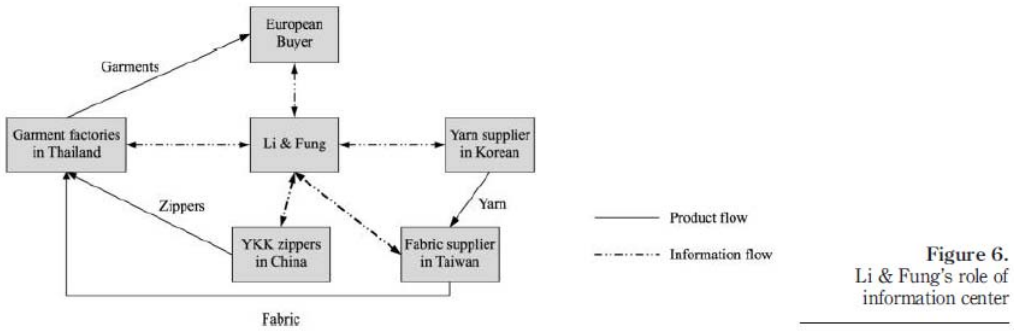


Figure 6.
Li & Fung's role of information center

Source: Cao, N., Zhang, Z., ManTo, K., & Ng, K. P. (2008). How are supply chain coordinated? An empirical observation in textile-apparel businesses.

2.9.4.2 Information technology

Christopher, (2000) highlights the importance of information technology for agile supply chains. He described successful agile supply chains as a virtual network which is connected through internet, EDI and other means of new technology. This enables supply chain members to establish partnerships for better supply chain performance by accurate and timely information allows a firm to optimize its internal processes and thus to impart a more productive output to the system.

However, he still emphasizes the fact that information technology is key and important for both lean and agile strategies though agility requires some advancement.

2.9.4.3 Collaborative relationships

Collaborative relationships among supply chain members enable supply chain partners to leveraging and capitalising on their strengths and capabilities and to operate in their optimal capacities to give the best output at the most efficient rate as far as the final customer requirement is concerned (Christopher, Logistics & Supply chain management , 2011, pp. 214-216) .

The way in which relationships are managed among supply chain members depends on whether it is an agile or lean supply chain. In an agile supply chain, collaboration should be better. Establishing better relationships with supply chain partners could improve the agility of the supply chain (Ambe, 2012) as cited in (Duarte & Machado, 2011: 330).

By drawing on the capabilities (i.e., capacity and skills) offered by the supply chain (the set of upstream and downstream entities who work either directly or indirectly with the firm) and by developing and fostering appropriate ties with both customers and suppliers, firms can realise significant benefits in the form of reduced inventories, lower costs, enhanced responsiveness, and improved strategic focus in terms of design, execution and capital investments. (Melny, Narasimhan, & DeCampos, 2014) as cited in (Harvard Business Review 2006)

Most of supply chain issues are due to poor relationship and coordination between supply chain partners (Fisher, 1997). It is important to work with few key suppliers for a more efficient supply chain

Successful companies of tomorrow will be those that drive supply chain collaboration (SCC) more strategically, creating new revenue opportunities, efficiencies, and customer loyalty. Collaboration between apparel retailers and manufacturers can bring benefits to both parties. A well-focused collaborative effort can improve profitability, reduce waste, and contribute to more valuable relationships between retailers and their manufacturing partners (Anbanandam, Banwet, & Shankar, 2011)as cited in (Greenbaum, 2004).

2.9.4.4 Production (facilities)

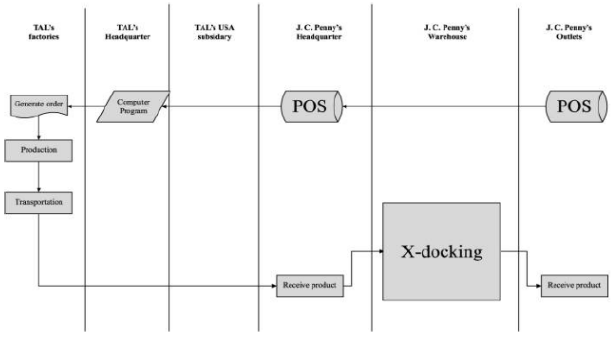
(Ambe, 2012) has summarized this pint in his research referring to the studies by Nel & Badenhorst-Weiss, 2010. If a company has a strong infrastructure where factories and warehouses are built with a lot of excess capacity, they can be very flexible and respond quickly to swings in product demand Facilities where all, or almost all, capacity is being used are not capable of responding easily to fluctuations in demand.
So if a firm has strong infrastructure facilities with excess capacity, it can follow an agile strategy and in contrast if the capacity conditions are too tight, a lean approach will suit best.

2.9.4.5 Inventory

Inventory allows a company or an entire supply chain to be very responsive to fluctuations in customer demand. However, creating and storing inventory is a cost and to achieve high levels of efficiency, the cost of inventory should be kept as low as possible. An organisation can be responsive by stocking high levels of inventory for a wide range of products (Ambe, 2012) as cited by (Chopra & Meindl, 2010: 65).

When talking about inventory vendor managed inventory system is a key term which comes along with supplier collaboration part. Below is a typical VMI arrangement of a company through a 3rd party partner (Cao, Zhang, ManTo, & Ng, 2008).

Figure 2.21 – VMI operations



Source: Cao, N., Zhang, Z., ManTo, K., & Ng, K. P. (2008). How are supply chain coordinated ? An empirical observation in textile-apparel businesses. .

2.9.4.6 Location

Location refers to where supply chain facilities are geographically located (Jonsson, 2008: 53). It also includes the decisions related to which activities should be performed in each facility. The responsiveness versus efficiency trade-off here is whether to centralise activities in fewer locations to gain economies of scale and efficiency, or to decentralise activities
in many locations to be closer to customers and suppliers and so be more responsive. When making location decisions, managers need to consider a range of factors that relate to a given location, including the cost of facilities, the cost of labour, skills available in the workforce, infrastructure conditions, taxes and tariffs, and proximity to suppliers and customers. Location decisions tend to be very strategic decisions because they commit large amounts of money to long-term plans (Nel & Badenhorst-Weiss, 2010: 211). Location decisions have a strong impact on the cost and performance characteristics of a supply chain. Once the size, number and location of facilities are determined, this also defines the number of possible paths through which products can flow on the way to the final customer (Chopra & Meindl, 2010: 63).

2.9.4.7 Transportation /Logistics

Transportation refers to the movement of everything from raw materials to finished goods between different facilities in a supply chain (Jonsson, 2008: 63). In terms of transportation, the trade-off between responsiveness and efficiency is manifested in the choice of transport mode (Taylor, 2004: 23). Fast modes of transport, such as aeroplanes, are very responsive but also more costly. Slower modes, such as ship and rail, are very cost efficient but not as responsive. Since transportation costs can be as much as a third of the overall operating cost of a supply chain, these decisions are very important (Jonsson, 2008: 64; Nel & Badenhorst- Weiss, 2010: 211).

According to Pang (2007), supply chain is all about having the right product in the right place at the right time at the right price (Kumar & Arbi, 2007). The logistical challenges faced by the entire international apparel industry include shrinking product life cycles, multiple vendors and manufacturing locations, rising expenses, and lack of process visibility, among others (Pang, 2004, as cited in Kumar & Arbi, 2007).

Logistics provider companies such as Third Party Logistics (3PL) are helping global companies cope with this logistic challenge while not having to pay high-freight costs. This can be verified through a cost-benefit analysis of how much it would cost to use a freight-forwarding company versus how much it would cost to build the same network in-house (Pang, 2004, as cited in Kumar & Arbi, 2007).

2.9.4.8 Sourcing

Sourcing refers to the set of business processes required to purchase goods and services (Hines, 2006: 177; Jonsson, 2008: 164). Sourcing decisions are crucial because they affect the level of efficiency and responsiveness the supply chain can achieve. Outsourcing certain processes to other parties may increase a supply chain's efficiency, but may reduce its responsiveness because of possibly longer lead times to achieve economies of scale (Nel & Badenhorst-Weiss, 2010: 211). In contrast, responsiveness can be increased by gaining state-of-the-art products. Outsourcing decisions should be driven by a desire for growth in total supply chain surplus (Chopra & Meindl, 2010: 73).

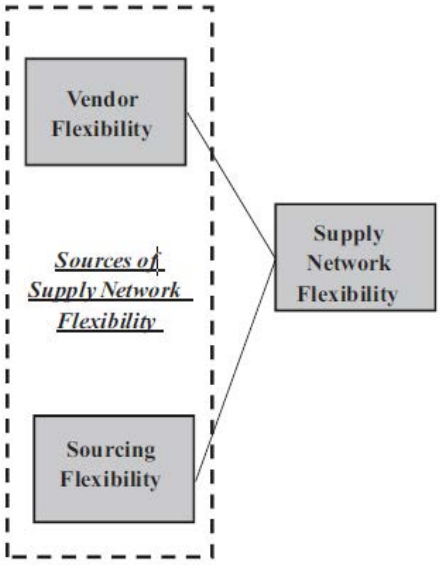
Over the years continuous debates and studies done by Dwyeretal (1987), Lamming (1993), Kanter (1994), Handfield and Bechtel (2002) were done over the need for closer relationships between customers, suppliers and other relevant stakeholders (as cited in Purvis, Gosling, & Naim, 2014). Among all the supply chain strategies, lean has emphasised the need to create supplier partnerships, reduce the number of suppliers, transfer of responsibilities upstream in the supply chain and empowerment (Sako et al RichandHines and Ikeda as cited in Purvis, Gosling, & Naim, 2014).

However with the dynamic and uncertain market conditions the need arose for organisations to become more agile and responsive to the needs of customers (Childerhouse and Towill, Lee, as cited in Purvis, Gosling, & Naim, 2014).

According to Swaffordetal (2006), flexibility of a supply network can be defined as, the flexibility of its individual nodes primarily focuses on the existing supply chain structure and reflects an arrow view of supply chain flexibility (as cited in Purvis, Gosling, & Naim, 2014). By contrast, sourcing flexibility reflects the fact that the main source of a supply network's flexibility might not be a particular vendor's responsiveness capability, but the leading firm's ability to coordinate the entire supply chain and redesign the network quickly and at low cost (Tachizawaand Thomsen, as cited in Purvis, Gosling, & Naim, 2014).

Figure 2.20 framework distinguishes between two sources of flexibility: the flexibility of individual nodes within the system (vendor flexibility) and/or the ability of the focal firm tore-design (re-configure) and manage (coordinate) the supply chain (sourcing flexibility). The framework acknowledges the fact that internal capabilities of individual nodes with in the chain are a necessary but entirely a sufficient condition for achieving supply chain flexibility and that the external supply network will also have a significant effect (Fisher, as cited in Purvis, Gosling, & Naim, 2014).

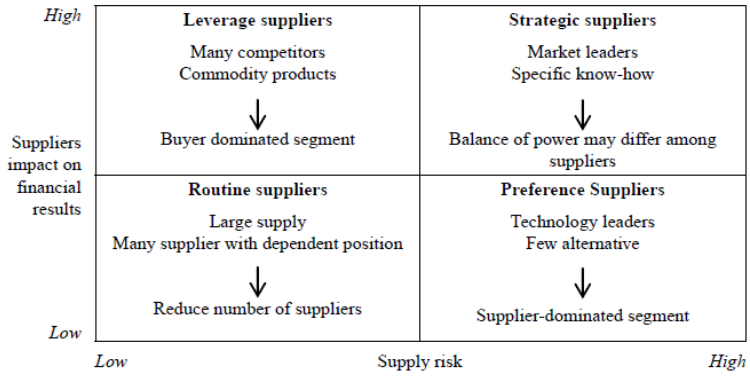
Figure 2.22 – Supply network flexibility framework



Source : Purvis, L., Gosling, J., & Naim, M. N. (2014). The development of a lean , agile and legile supply network taxanomy based on differing types of flexibility

Further on sourcing and supplier management, (Wu & Barnes, 2012) has discussed on how to segregate the suppliers and manage them according to strategic priorities.

Figure 2.23– Classification matrix of suppliers



Source : Wu, C., & Barnes, D. (2012). A dynamic feedback model for partner selectin in agile supply chains.

2.9.4.9 Pricing

Pricing is the process by which a firm decides how much to charge customers for its goods and services. Pricing affects the customer segments that choose to buy the product, as well as customer expectations. This directly affects the supply chain in terms of the level of responsiveness required, as well the demand profile that the supply chain attempts to serve (Chopra & Meindl, 2010: 74). Pricing is a significant attribute through which firms execute a competitive strategy. Customers expect low prices but tend to be comfortable with a lower level of product availability. Steady prices also ensure that demand stays relatively stable.

Therefore, pricing affects the behaviour of the buyer of the product, thus affecting supply chain performance. Customers who value responsiveness will pay more for higher levels of customer service (Nel & Badenhorst-Weiss, 2010: 211).

2.10. Best performers

2.10.1 Identifying the best supply chain

It is hard to identify the best Supply chain because supply chain is an integrated function so can't just evaluate on its own. Supply chain goal is to deploy cooperate objectives and business objectives.

So measuring supply chain is not a straight forward exercise. It makes sense to use a combination of qualitative and quantitative factors

2.10.2 Key supply chain related KPIs

Referring to the studies done on performance measurement in supply chain, two segments can be identified as qualitative and quantitative aspects (Chan, Qi, Chan, Lau, & lp, 2003)

Table 2.5 – Types of supply chain measurements

Qualitative	**Quantitative**		
Customer satisfaction	Cost based	Customer service	Productivity
Flexibility	Cost minimization	Lead time	Capacity utilization
Material flow and information integration	Sales maximization	Fill rate	Resource utilization
Effective risk management	Profit maximization	Product lateness	
Supplier performance	Inventory investment minimization		

As clearly visible most of the aspects are difficult to quantify. However financial ratios will give a general idea of how a company's supply chain is performing. Also Gartner, an American research agency uses some indicators to evaluate best supply chains as below. They use mainly financial indications to identify best supply chains.

- **Return on assets (ROA)** — Net income / total assets
- **Inventory turns** — Cost of goods sold / inventory
- **Revenue growth** — Change in revenue from prior year
- **Corporate social responsibility** — Index of third-party CSR measures (Gartner Supply Chain Top 25 Methodology, 2016)

Table 2.6 – Supply chain related financial ratios.

Financial ratio	**Formula**
Gross margin ratio	=Cost of goods sold / Sales
Operating income ratio	=Operating income / Sales
SAGT/ Sales ratio	=Sales general and admin cost / Sales
Inventory turnover	=Cost of sales /Average inventory

Source: Fridson, M., & Alvarez, F. (2002). Financial Statement Analysis.

2.10.1 Zara- Inditex group

Inditex is one of the largest apparel supply chains in the world with 8 popular brands. It has its route to 1963 when it started as a small family owned business. Today Inditex operates 7504 stores globally in 94 markets and with a workforce of 162,450 employees. Zara is the biggest brand out of that with 2206 stores worldwide. (Inditex website, 2018)

Ortega founded Zara in 1975 as an attempt to better understand world markets for his fashion merchandise. From that first store in Spain, Zara has since expanded to 2206 stores in 94 countries around the world. (Christopher, The Agile Supply Chain : Competing in Volatile Markets, 2000) Mentions Zara is one of Spain's most successful and dynamic apparel companies, producing Fashionable clothing to appeal to an international target market of 18 to 35 year-olds (Aabed, 2017).

(Ferdows, Lewis, & Machuca, 2003) States about Zara as a brand driven by newness. Their customers always see Zara as a place where they can buy new styles, designs and shapes. However, they manage to run with a very low inventory level, typically only a few pieces of each model and this often means that a store's entire stock is on display. So the business requires very fast replenishments too.

Zara is striving to create products which have a short product life cycle. This way the company gets the customer to feel that if they do not buy an item when they see it, it might be gone the next time they visit the store. The focus on short lead-times is very high because Zara wants to be able to offer the customer the items that they are demanding in right time. When a new trend is identified it only takes Zara 30 days to produce it and get it to the store. This is a great advantage that Zara has and it also increases the time of sale of a trend (Hansson, 2011)as originally cited in (Dutta, 2002). Zara sells 85 percent of its items at full price compared to the industry average of selling only 60 percent of items at full price. Annually there is 10 percent of inventory unsold compared to industry averages of 17 – 20 percent. (Aabed, 2017).

2.10.1.1 Zara supply chain strategy

Christopher (2000) States Zara the Spanish fashion company provides a good example of this hybrid supply chain strategy he further explains that Zara's international market positioning places it in direct competition with some of the most skilled operations in the business, including some of US and EUROPEAN Fashion brands.

Its rapid growth and on-going success in such a fiercely competitive environment is in fact a testament to its ability to establish an agile supply chain which still incorporates many 'lean' characteristics. The pursuit of this hybrid strategy has enabled Zara to develop one of the most effective quick-response systems in its industry.

(Zhenxiang & Lijie, 2011) Also identifies their unique competitive advantage in fashion retail industry. In general, a typical clothing company manufacturing in Asia could take six to nine months to get a new design into the shops. However, with a strong logistics system,

an entirely new Zara garment takes about five weeks from design to delivery. This is true result of great supply chain management.

Many fashion companies today outsource their production to countries in Asia where the production costs are low, however Zara has 80 percent of its production within Europe. To keep high flexibility and control Zara owns a lot of its production, approximately half of all manufacturers are owned by Zara (Hansson, 2011) as originally cited by (Dutta, 2002).

2.10.1.2 Zara process

2.10.1.2.1 Product development/design

Zhenxiang & Lijie (2011) Mentions in his study that product development is a key competitive edge for them. ZARA produce designs for approximately 40,000 items per year from which about 10,000 are selected for Production when their counterparts like H&M or Gap. Can only manage 2,000-4,000 from companies. This helps them to approach a wider customer base and a high basket rate and a conversion rate.

Ferdows, Lewis, & Machuca (2003) Also identifies some key aspects in ZARA development process. The inspiration is sought from myriad global sources (e.g. trade fairs, discotheques, catwalks, magazines).

Christopher (2000) Highlights some more avenues as competitors' stores, university campuses, pubs, cafes and clubs, plus any other venues or events deemed to be relevant to the lifestyles of the target customers. And most importantly they have an integrated development process where all cross functional teams engage so that the product developed will gain more acceptance in the market. In addition, the team's understanding of fashion trends is further guided by regular inflows of EPOS data and other information from all of the company's stores and sites around the world.

Figure 2.24– Design and sample making process

Source: Author

2.10.1.2.2 Sourcing/supplier management

Christopher (2000) Highlights the sourcing strategy of Zara. Raw materials are procured through the company's buying offices in the UK, China and the Netherlands, with most of the materials themselves coming in from Mauritius, New Zealand, Australia, Morocco, China, India, Turkey, Korea, Italy and Germany. Approximately 40% of garments - those with the broadest and least transient appeal – are imported as finished goods from low-cost manufacturing centres in the Far East.

Ferdows, Lewis, & Machuca (2003) Discuss about its manufacturing supplier portfolio. Which partially are in Europe, and most of the rest in Asia. Many of the European suppliers are based in Spain and Portugal, and Zara exploit this geographical proximity in order to ensure quick response to Zara orders – critical for fashion products. From Asia, Zara procure "basic" products and those for which the region has a clear cost or quality advantage. With its relatively large and stable base of orders, Zara is a preferred customer for almost all its suppliers.

Christopher (2000) Further discuss about supplier partnerships. Zara provides suppliers with necessary technological, financial and logistical support required to achieve stringent time and quality targets.

Having the right supplier mix is a key point in Zara. Having vertically integrated supply chains makes it possible to constantly produce new products with short lead-times (Mcafee et al, 2004). It is mostly the high fashion products that are demanding short lead- times. Products such as men's shirts are not demanding such short lead-times since they have a more constant demand. These products are produced in China and Turkey where the lead-time is two to four months (Hansson, 2011) as originally cited in (Macafee et al, 2004).

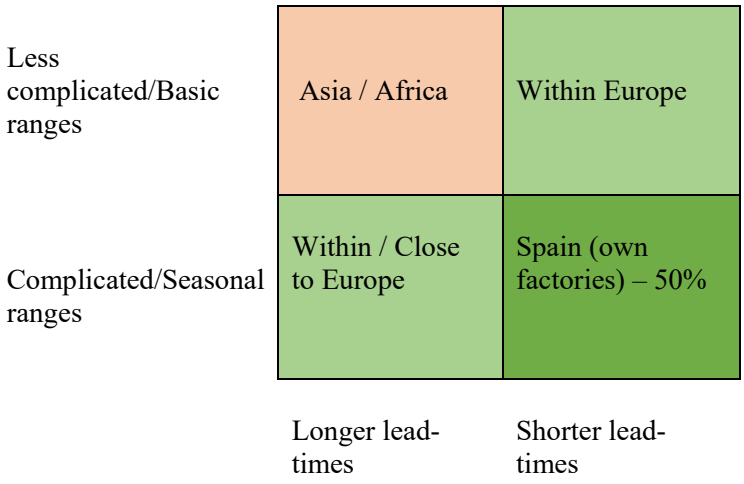
2.10.1.2.3 Production

Ferdows, Lewis, & Machuca, (2003) Discuss about Zara manufacturing strategy in his study. Approximately 50% of its products are produced in its own network of 22 Spanish factories (18 of which are located in and around the La Coruña complex).

Aabed (2017) Identifies that Zara factories in Spain use flexible manufacturing systems for quick change over operations so as to enable the agility in supply. In addition, Zara has below geographical portfolio in their sourcing

- 50% of all items are manufactured in Spain
- 26% in the rest of Europe
- 24% in Asia and Africa

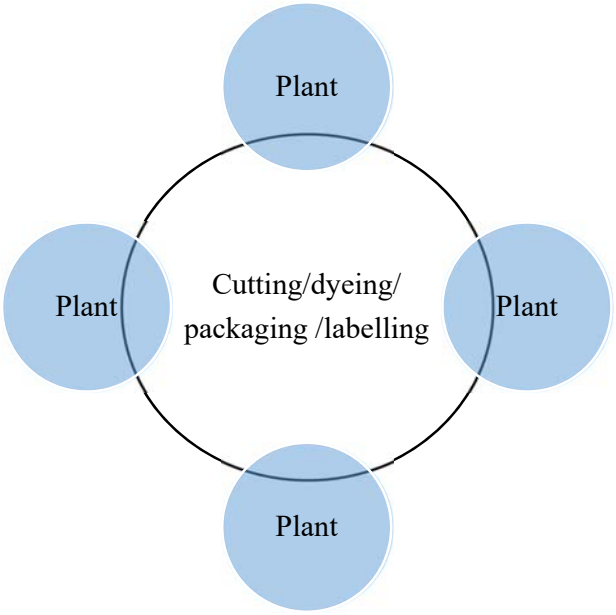
Figure 2.25– Zara sourcing strategy



Source: (Aabed, 2017)

(Christopher, 2000) Further highlights the features of legality in Zara's manufacturing systems. He identifies that the production systems are well refined using ideas developed in Conjunction with Toyota. Only those operations which enhance cost-efficiency through economies of scale are conducted in-house (such as dying, cutting, labelling and Packaging). All other manufacturing activities, including the labour-intensive finishing stages are completed by networks of more than 300 small subcontractors, each specialising in one particular part of the production process or garment type. These Subcontractors work exclusively for Zara's parent, Inditex SA.

Figure 2.26– Zara operational manufacturing structure



Source: Author

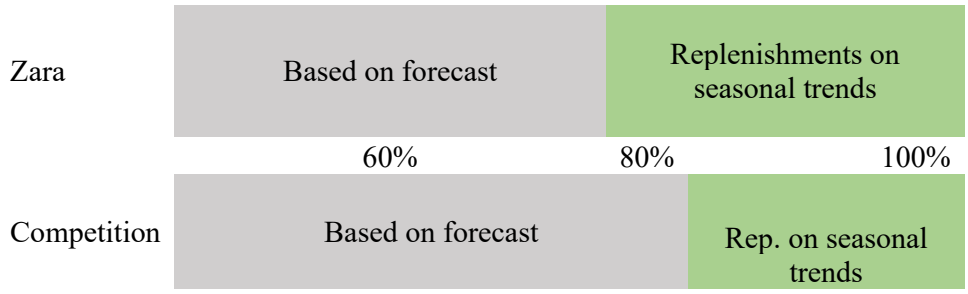
Also it identifies the use of postponement strategy as material or fabric is also held in 'greige' i.e. Undyed and unprinted and if demand for a particular garment turns out to be higher than expected then local manufacturers can quickly manufacture additional product.

2.10.1.2.4 Operations/ Logistics

Zara works on a mix model for distribution. For the first lot the central warehouse receives the shipment through which the stores get the goods and for replenishment orders, stores will directly get the shipments to the shop (Caro, Gallien, Javier García Torralbo, Calamonte, & Correa, 2009).

Factories can increase and decrease production quickly, thus there is less inventory in the supply chain and less need to finance that inventory with working capital. They do only 50 – 60 percent of their manufacturing in advance versus the 80 – 90 percent done by competitors. So Zara does not need to place big bets on yearly fashion trends.

Figure 2.27– Demand forecast and production (Zara Vs Competitors)



Source: (Aabed, 2017)

This clearly defines the success of Zara as cited by (Aabed, 2017)Zara sells 85 percent of its items at full price compared to the industry average of selling only 60 percent of items at full price. Annually there is 10 percent of inventory unsold compared to industry averages of 17 – 20 percent.

They can make many smaller bets on short term trends that are easier to call correctly. Zara buys large quantities of only a few types of fabric (just four or five types, but they can change from year to year), and does the garment design and related cutting and dyeing in-house. This way fabric manufacturers can make quick deliveries of bulk quantities of fabric directly to the Zara DC – the Cube. The company purchases raw fabric from suppliers in Italy, Spain, Portugal and Greece. And those suppliers deliver within 5 days of orders being placed. Inbound logistics from suppliers are mostly by truck.

The Cube is 464,500 square meters (5 million square feet), and highly automated with underground monorail links to 11 factories within a 16 km (10 mile) radius of the Cube. All raw materials pass through the cube and all finished goods also pass through on their way to stores.

The 11 Zara owned factories are connected to the Cube by underground tunnels with high speed monorails (about 200 kilometres or 124 miles of rails) to move cut fabric to these factories for dyeing and assembly into clothing items. The factories also use the monorail system to return finished products to the Cube for shipment to stores. Here are some facts about the company's manufacturing operations:
(Aabed, 2017).

2.10.2 Walmart

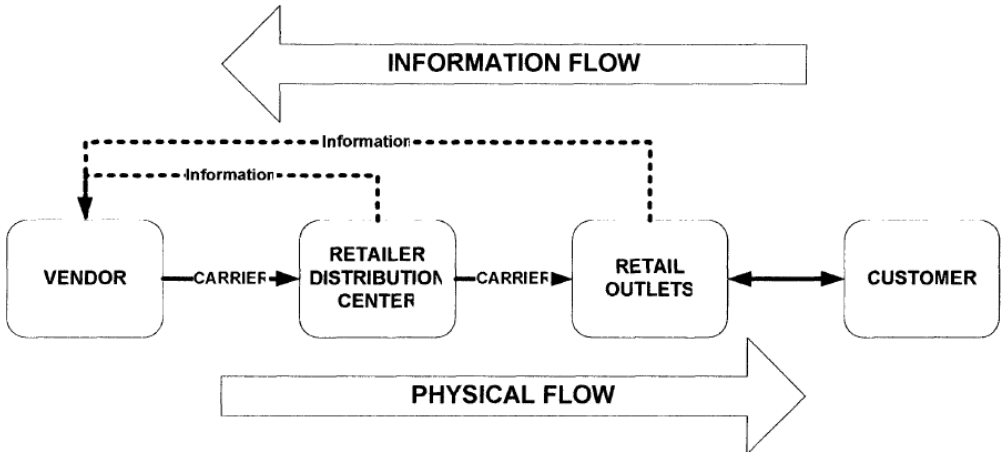
Walmart headed the fortune 500 list 2017 also with a 4.8 billion USD turnover. And 2.3 million people are working in Walmart (http://fortune.com/global500/walmart/, 2018). To better understand the figure it is about 10% of Australian population (Australian bureau of statistics, 2018) and the size of the total entire apparel industry turnover in Sri Lanka. (www.cbsl.gov.lk, 2018)

Sam Walton opened the first Walmart store in Roger, Arkansas in 1962. He driven the business from the beginning through low cost- low price strategy. Driven by its extra ordinary success, Walmart went public 1970. Fuelled by this finances and through the visionary leadership of Sam Walton and his concept of incorporating new technology in to the business, Walmart continued its success each year and today it is considered as the pinnacle of retail industry. (Wall mart coperate , 2018)

Each week, over 260 million customers and members visit our 11,695 stores under 59 banners in 28 countries and e-commerce websites in 11 countries. Walmart continues to be a leader in sustainability, corporate philanthropy and employment opportunity. It's all part of our unwavering commitment to creating opportunities and bringing value to customers and communities around the world. (https://corporate.walmart.com/our-story, 2018)

Walmart is a retailing business so apparel retailing is just a segment of their business. However just as in most other segments they have been able to secure the status of COST LEADER in apparel segment too. Therefore, it is important to study their supply chain practises so it will not include the entire supply chain as for a normal fashion retail brand.

Figure 2.28– Walmart supply chain



Source: Author

2.10.2.1 Zara supply chain strategy

2.10.2.1.1 Sourcing /supplier management

As discussed in (Abbott, Finch, Lo, Pawlinski, & Reyes, 2014), Walmart uses global merchandising centre concept to leverage on the volumes to get the best price and also to achieve the best price. Also that helps them to get best negotiations and communications with third part logistic companies too. Further they summarize some other research findings as this practise of direct purchasing has helped them to lower the cost 5-15%.

(Abbott, Finch, Lo, Pawlinski, & Reyes, 2014) Further highlights that Walmart's key strength is buying power and they very cleverly capitalize on that. Most of their vendors' reply on Walmart volumes so they always consider Walmart strategic to them and Walmart use that attain the best prices from them.

In terms of sourcing locations and geographical distribution, Walmart always prefer to have a choice from local or regional suppliers to mage the geographical complexities (Chandra, 2003).

(Chiles & Dau, 2005) Discuss about the level of supplier collaboration and its effect towards the improved supply chain practises. Walmart manage the relationships differently

since each vendor is different, depending on the volume and value of products they sell to Wal-Mart. The level also depends on the amount of capital vendors have to invest in building a collaborative relationship with Wal-Mart. Larger vendors are more inclined to invest employees as well as technology to exploit the information shared by Walmart. Some larger suppliers have even opened offices in Bentonville, AR to be near Walmart's headquarters and strengthen communication efforts.

Furthermore, Wal-Mart understands how integrated its supply chain. Wal--Mart have a supply chain with a high degree of functional and organizational integration in which new service or product development, supplier relationship, order fulfilment, customer relationship processes, and its internal and external associations are integrated into the business in order to minimize the disruptions resulting from unexpected changes in demands or supplies in the supply chain (Nguyen, 2017) as originally sited by (Johnson 2008).

2.10.2.1.2 Manufacturing sourcing/ supplier management

As discussed in other sections, Walmart always pressurize the suppliers to offer them the best prices which is in turn a positive stress for them also to look at options of structuring their supply chains an reduce costs (Abbott, Finch, Lo, Pawlinski, & Reyes, 2014). The research further discusses on their approach on promoting local manufacturing. This is a good example of trying to restructure the supply chain to cater the new developments in society.

Also as highlighted earlier they always prefer regional and near shore manufactures when selecting suppliers for a particular product.

2.10.2.1.3 Logistics/warehousing

Logistics and warehousing is key for Walmart success. They have an extensive distribution network with 158 centres which are strategically located close to stores (Abbott, Finch, Lo, Pawlinski, & Reyes, 2014). Also they use different ware house optimization techniques such as cross docking, direct to vendor, assembling at than in ware house (Chiles & Dau, 2005) .

When it comes to logistics Wal-Mart is successful in operating its private trucking system. A powerful transport system is the highlight of Wal-Mart's logistics infrastructure with more than 3,500 trucks serving for distribution centres. These truck fleets enable logistics division to finish goods shipment from distribution centres to stores for a short time and to replenish inventory every week. Also, this organization has an innovative cross-docking logistics technique that can enhance the efficiency of distribution, which is able to classify and convey the merchandise from factories to warehouses of Wal-Mart, and then fast and directly transfer products from inbound to outbound trailers without extra storage (Nguyen, 2017).

2.10.2.1.4 Use of information technology

According to research paper highlights, the key points of information technology and supplier integration. Wal-Mart's order processing is fulfilled by an integrated technology imbedded in the products taken off the shelf by the customers. As the product is scanned using the SKUS the inventory level on the Point of Sales System drops and is connected to a system called Retail link that takes the SKUs scanned and sends them up to Wal-Mart's satellite system giving vendors and suppliers real-time data. This data tells vendors what products are being purchased, at what quantity, and when to restock the stores levels. This is an advantage to vendors so that they know what products to continue supplying and what products to pull form the shelves (Abbott, Finch, Lo, Pawlinski, & Reyes, 2014).

Furthermore, the combination of these logistics technologies with REMIX technology and a satellite network that has brought great benefits for Wal-Mart in recent times, now have changed the approach to dispense the high velocity goods, for instance, bread, vegetables, etc. from lower level of automation to automation. By using these technologies, one distribution centre can serve a cluster
of retail outlets as well as add food distribution centres in the supply chain to handle the high velocity goods (Nguyen, 2017) as originally cited by [Abbaterusso 2010].

(Chandra, 2003) Mentions that Wall mart has already reaped the benefits of these logistics and warehousing strategies by achieving 2% cost difference and 4 times faster lead time in product replenishments.

2.10.2.1.5 Inventory management

- **Advanced technology**

Wal-Mart currently has a large amount of inventory on hand; due to this fact, Wal-Mart decided to increase capital expenses that lead to improved operations. By investing billions, Wal-Mart has improved their tracking and inventory management, which has led to stronger, accurate sales forecasting. Wal-Mart invested in improved technology so the company could reduce inventory waste by allowing stores to manage their own stocks by reducing pack sizes across many product categories, and timely price markdowns (Chandra, 2003)

- **Vendor managed inventory**

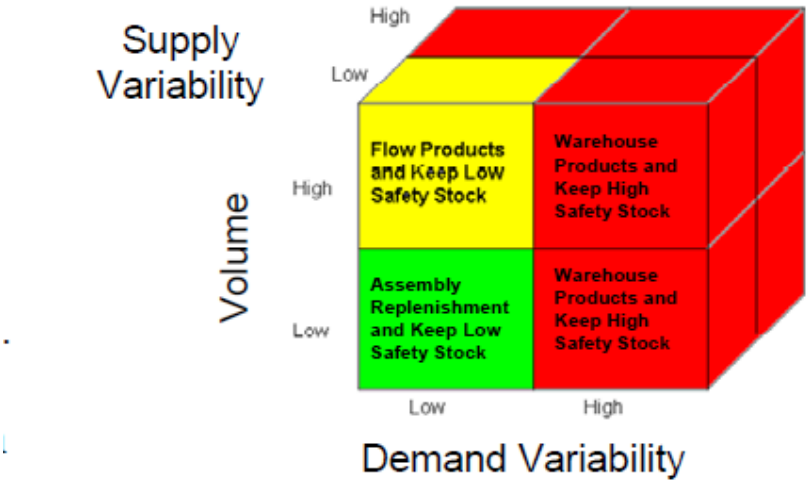
Wal-Mart also has invested on a retail link system, which is used by suppliers to manage their own products at the Wal- Mart store. The Retail Link System is known as vendor management inventory (VMI) (Abbott, Finch, Lo, Pawlinski, & Reyes, 2014) originally sited by (University Alliance, 2014).

VMI is an initiative where vendors are responsible for determining retail replenishment levels and managing the amount of inventory that the retailer has on hand. When retailers participate in VMI, they are allowing their suppliers to know the actual demands of their products and provide automatic replenishment at the retailing or distribution facilities. (Chiles & Dau, 2005) . Using VMI, suppliers can refill the merchandise without waiting for the customer's orders or approval. According to the Business Dictionary, the supplier can do one of two things when they are using VMI. The first one is that suppliers can monitor the customer's inventory using their own employees. The second one is that suppliers receive stock data from the customer through the information received from the Electronic Data Interchange (EDI), which is the one that Wal-Mart uses. According to Wal-Mart corporate website, they worked with more than 3000 suppliers (Wal-Mart's Supplier Diversity Program).

- **Stock management strategy**

Chiles & Dau (2005) Discusses about stock management strategies of Wall mart according to the supply and demand volatility.

Figure 2.29– Process differentiation based on product characteristics



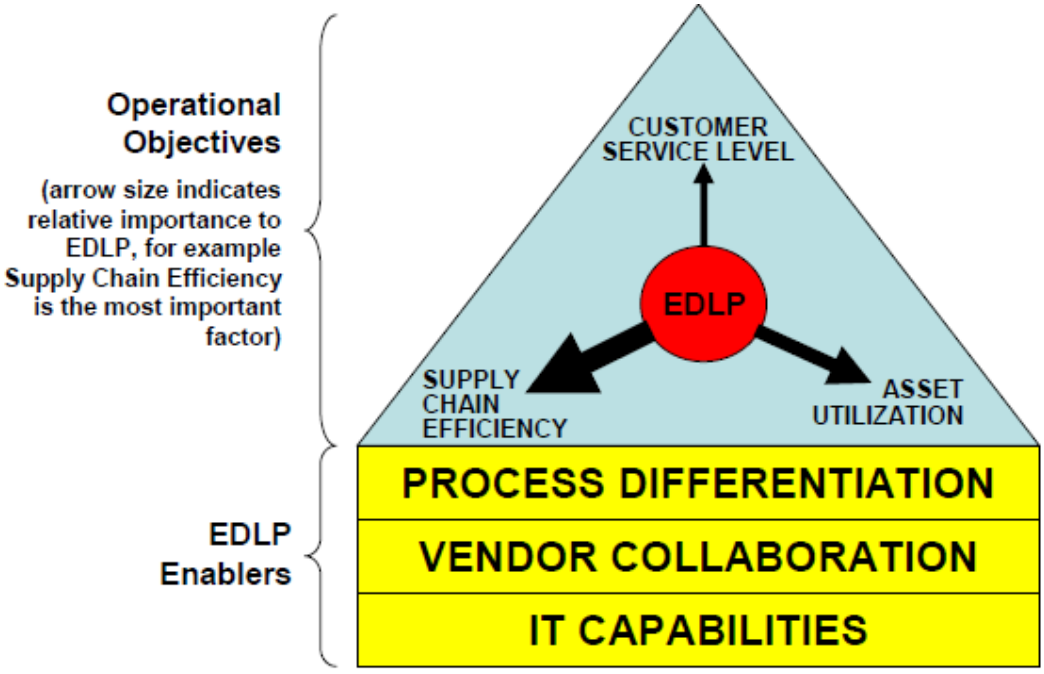
Source: (Chiles & Dau, 2005)

- **Supply chain strategy**

In terms of supply chain strategies, (Nguyen, 2017) argues that they have a strong agile component in their supply chain considering the fast response in natural disaster situations.

(Chiles & Dau, 2005) Has defined a model to describe the supply chain strategy of Walmart in conjunction with its cooperate and business strategies. This argues that the main operational objective is improving the efficiency in supply chain.

Figure 2.30 – Walmart supply chain strategy pillars



Source: (Chiles & Dau, 2005)

Chapter 3

RESEARCH METHODOLOGY

3.1 Introduction

This chapter describes the methodology of the present research. It consists of research design which elaborates about sample selection and data gathering. Further he section will extensively discuss on questionnaire formulation. Furthermore, about the managing errors of research model so as to make sure the data gather reflects the perception of the population. Finally, it goes on to explain how the output of the data analysis were to be used.

Research design explains how overall research was planned towards achieving the research objective followed by a section on the sample selection which explained about how and what technique were used in sample selection considering their relationship to the research area, and also considering their segment in the supply chain like manufacturing, intermediaries and retailing. In addition to that it explains about data gathering like what were the routes of primary data and secondary data used.

The next part is the questionnaire. This section elaborates how the strategies were identified for the questionnaire through industry best practices, discussions with industry professionals and through the literature survey. The flow of identification of strategic options and narrowing down as fundamental business processes and areas to be discussed in the questionnaire is deeply described here

Finally, it wraps up with a discussion on what is expected from the questionnaire answers and a glimpse of how those will be used to create the final model.

3.2 Research Design

A research design is the arrangement of conditions for collection and analysis of data in a manner that aims to combine relevance to the research purpose with economy in procedure. In fact, the research design is the conceptual structure within which research is conducted it constitutes the blueprint for the collection, measurement and analysis of data

(C.R., 2004)So it is obvious that research design topic and the objectives should formulate the research design.

Research was titled as Identifying best supply chain model for a fashion apparel retail brand. So it about identifying the best supply chain strategies specific to apparel retail business. The research objectives were discussed in the first chapter also however to direct the flow; they have been listed below

- To identify the generic supply chain strategies used in companies in practical scenario
- Identify the strategic options practically related to those generic strategies
- Evaluate their applicability to apparel retail supply chains
- Formulate a supply chain model for a fashion apparel retailer brand

According to the categorization on research types by (C.R., 2004)his kind of a research can be identified as exploratory research studies which are also termed as formulate research studies. The main purpose of such studies is that of formulating a problem for more precise investigation or of developing the working hypotheses from an operational point of view. The major emphasis in such studies is on the discovery of ideas and insights.

Further he mentions that because the research problem, broadly defined initially, is transformed into one with more precise meaning in exploratory studies, which fact may necessitate changes in the research procedure for gathering relevant data. Therefore, he suggests 3 key methods for such research design as

(a) The survey of concerning literature

(b) The experience survey and

(c) The analysis of 'insight-stimulating' examples.

Most of the researches done on supply chain models are general ones which are not attached to a specific industry and in fact there are very few written on apparel retail trade. Therefore, this research required some additional information apart from just literature survey to make the theoretical information more cohesive to the apparel industry.

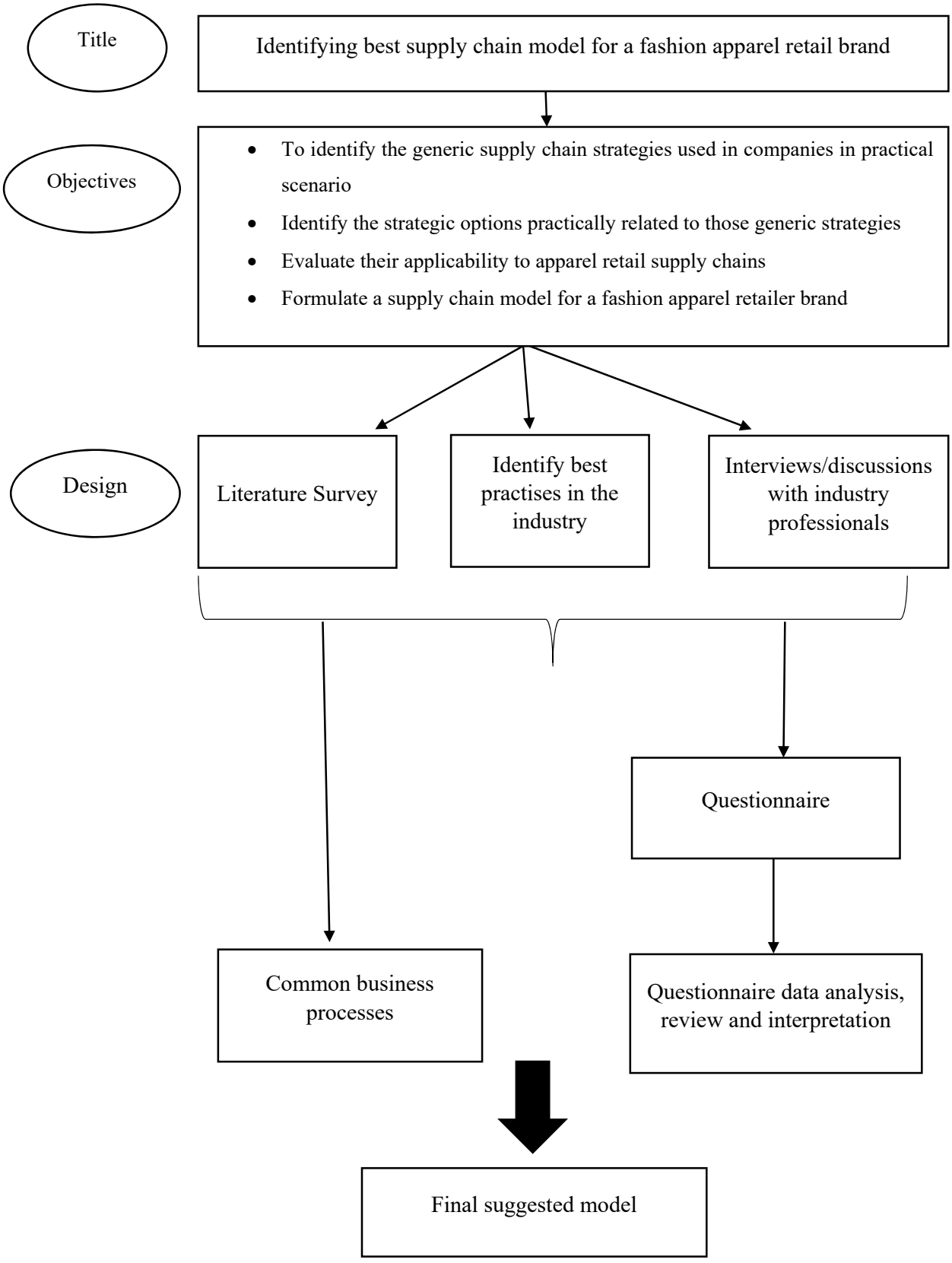
So in this case best performers were identified through financial data analysis and their supply chains were deeply studied to identify the supply chain strategies they use. Also concurrently a set of informal discussions were carried out with industry professionals and

they expressed their opinion on current issues in apparel supply chains and also the possible/potential solutions from their experience and exposure in their extensive careers in the industry. Finally, all the solutions were tabulated along with what was identified through literature survey and some obvious elements were segmented as a fundamental infrastructure and others were listed down as points for the questionnaire.

Finally, the points gathered though all 3 routes were reviewed and those were first segmented as fundamental business processes and another set of questions to be used for a questionnaire.

Figure 3.1 shows a graphical representation of the research design.

Figure 3.1 – Segments in apparel supply chain

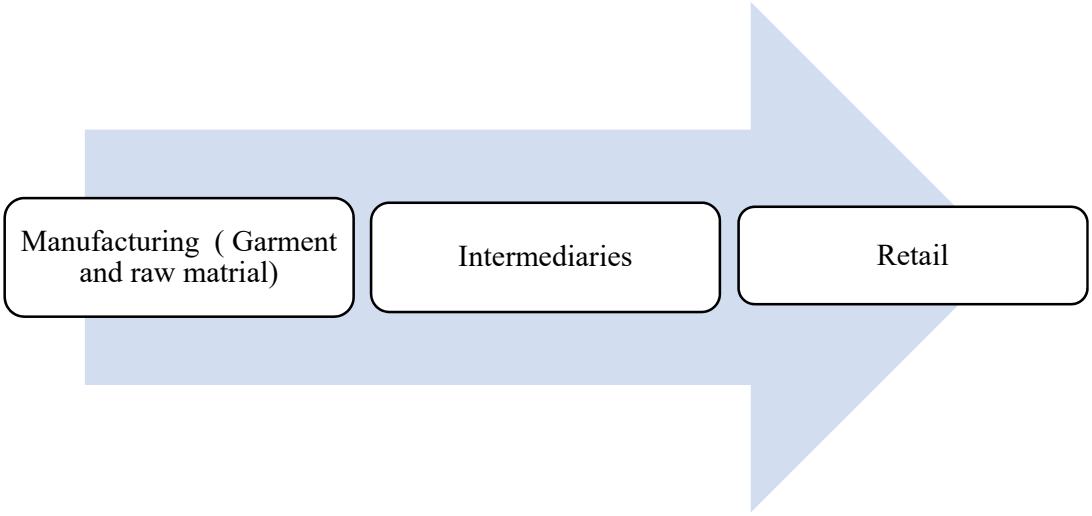


3.3 Selection of population and sample

3.3.1 Population

This research is about identifying best supply chain strategies for apparel retail business model. So for all the entities in apparel retail supply chain will be related to this exercise. As a very basic overview below structure can be explained.

Figure 3.2 – Segments in apparel supply chain



Source: Author

And to make things complex, apparel supply chains are much more globalized. A garment sold in USA/EU will have supply chain routes to countries all across the world. So it is important to understand that too. However, an important point to understand is that the same point is an advantage for a research because apparel supply chains are more cohesive though they are geographically scattered.

3.3.2 Population

As a sample to represent the population, the employees in apparel retail industry supply chain was considered. Apparel industry is a very dynamic industry when it comes to work force movements. It has considerably high employee turnover and most of employees have worked several entities in the supply chain throughout their career. In addition, when it comes to brand and retailing segment, most of them have worked with several apparel brands. So one individual in their response will carry a lot of background and consideration from their experience.

When defining the scope of the respondents, this questionnaire will not relate to any person or any employer since the questionnaire gather data/opinion on apparel retail business. Also in addition even from employees of apparel industry, only the people from supply chain and product development teams will command a practical sense to a supply chain related questionnaire. Therefore, a clear scope was defined at the beginning.

Scope – Professionals in apparel industry engaged in supply chain/product development / Marketing & retail / process improvement etc.

3.4. Selection of population and sample

3.4.1 Primary data sources

As Primary sources, questionnaire and semi structured interviews was used. As mentioned in the research design, three avenues were used to identify the strategic tolls used in apparel retail business and below data collection methods were planned for respective areas.

Table 3.1 – Data collection methods

Information route	Data collection method	Data collection type/source
Focussed group interviews	Semi structured /informal interviews	Primary data
Research questionnaire	Structured questionnaire	Primary data

Source: Author

3.4.2 Secondary data sources

As per the research plan the financial data and literature survey was carried out with secondary data.

Table 3.2 – Data collection

Information route	Data collection method	Data collection type/source
Literature survey	Previous research papers/journals/books	Secondary data/information
Financial data analysis	Financial reports of the retail companies	Secondary data

Source: Author

3.5.Questionnaire

3.5.1 Overview

As discussed in the literature survey, researches on supply chains have discussed about 3 key general strategies for supply chain management as Lean, agile and leagile which is combination of both. However, there is no clarity of which strategic tools are applicable for these general strategies. For example, material standardization is discussed on both lean and agile concepts. So the knowledge to gather from the previous researches is that Lean and Agile and not separable strategies but they need to be practiced as an integrated model especially considering the product and customer behaviour.

Also most of the researches have discussed in general for all the industries but every industry has their own differences so it is important to understand how these generic strategies and the related strategic tools are applicable to apparel retail industry.

As the most practical method a questionnaire was designed to get the feedback on how apparel industry professionals perceive this with their experience and exposure with different brands and business models over their careers.

3.5.2 Structure of the questionnaire – Phase 1

3.5.2.1 Financial data analysis

This was done in order find out who are the best performers in terms of financial performance in apparel retail business. The argument is if a company or a brand perform financially well, the current supply chain practices also can be arguably best in the industry. There can be some exceptions but it is very unlikely for a firm to financially outperform others when they are having a poor unaligned supply chain management About 30 publicly quoted business who involve in apparel retail business were identified. These firms fall in to different categories like Brands, retailers, department stores and some of the companies are in to other businesses too. So the financial values are not only for apparel. However, this exercise it purely to identify few top performers so as to study their supply chains in detail and to understand what the current best practices are.

3.5.2.1.1 Financial data analysis

Below table 3.3 refers to interpretation of identified key financial ratios and Appendix 1 include the calculations done for main brands involved in apparel industry.

Table 3.3 – Financial ratio interpretation

Financial ratio	Equation	Interpretation
Gross margin ratio	Cost of goods sold / Sales	This is an indication of the supply chain strength. How much does the company pay for the products against the sales price
Operating income ratio	Operating income / Sales	This is the profit ratio after all the operating cost. Gross margin depends on the business model. If a company has a huge brand value of if it's a luxury product, then the gross margin can be too high but Operating margin will be lesser due to high operating costs. Operating cost is to a major extent independent of the business model.
SAGT/ Sales ratio	Sales general and admin cost / Sales	This is an indication of the sales and admin cost of a company against sales.
Inventory turnover	Cost of sales /Average inventory	This is an indication of how fast a company turn its inventory in to sales. This is an indication of price points, sourcing and supply chain strength.

After considering all the key indicators. Inventory turnover ratio and operating margin was identified as key indicators of supply chain strength. Obviously this will not reflect the true

supply chain strength. This is just to identify few best performers so as to study their supply chains.

However, these two factors are somewhat contradicting. For example, of a company is making huge margins it less likely to perform a good inventory turnover ratio and in contrast ones with high inventory turnover values will not have high operating margins. So drawing a matrix with two indicators appeared to be a good option.

Appendix -2 includes the constructed matrix based on the above financial ratio analysis.

After analyzing the information, “Zara” and “Walmart” was identified as best performers.

3.6 Key observation from best performers

3.6.1 ZARA

The key points to highlight is that Walmart uses predominantly a lean supply chain strategy where they focus on achieving lowest cost to support their competitive advantage of cost leadership requirement. However, they have shown their ability to fast response also in some practical incidents as highlighted in the study above. Therefore, generally it can be discussed as a leagile strategy though as not as strong as Zara.

3.6.1.1 Business process/ operational structure

1. Zara has advanced IT systems to facilitate the processes. The systems connect all internal value streams such as development / design / production / procument / manufacturing / sales etc. and also system enables external manufacturing partners also to have data and information.

2. Work through regional offices is a key highlight because that helps them to get a productive output and to overcome geographical distance, cultural difference, logistic complexities, better negotiations etc.

3. Strategic partnerships with suppliers is also a key highlight discovered from the research. Zara has supplier development programs, supplier engagement programs and also Zara works as join improvements with suppliers

4. Zara seems to have strongly capitalized on the supply chain structure to strengthening their position on supporting environment and social sustainability. In their website Zara clearly highlights the fact that majority of the production is internal and how that helps towards social support. This is a great example of how supply chain strategies can be set in line with the business competitive advantage or vice versa.

3.6.1.2 Manufacturing

1. Zara has a unique strategy for manufacturing. Almost all the top retail brands moved to out sourcing strategy to reduce cost. But Zara still trust in owning the vertical supply chain and it seems to be working well with them.

2. Zara uses postponement strategy very successfully to manage inventory and also to support fast turnaround time for replenishment orders.

3. Zara uses a centralized dyeing/ cutting /labelling and packaging process to leverage on the volumes and to maintain the quality standard.

4. Zara uses contract manufacturers for specialized operation in garment manufacturing so they can maintain quality and also reduce costs too.

5. Zara runs in a fast replenishment model/ Store is responsible in forecasting demand and that happens very close to selling. That helps them to achieve better margins and major portion to be sold at label prince.

3.6.1.3 Manufacturing

1. Walmart promotes internal and regional sourcing. This helps them to reduce the complexities in managing the supply chain too.

2. Walmart uses Vendor managed inventory strategy with key suppliers and it helps to efficiently manage the inventories and also fill rates

3.6.1.4 Logistics

1. Zara uses centralized ware housing system to make sure the production and stock management is efficient. However, the replenishments are directly shipped to the stores by truck or by air.

2. Zara uses 3 rd. party logistic companies for deliveries to stores to have an efficient and low cost operation

3.6.1.5 Sourcing and supplier management

1. Zara as most of the advanced businesses, have close relationships with suppliers.

2. Zara does most of their sourcing on their own through their own buying offices in several countries

3.6.2 Walmart

3.6.2.1 Business process/ operational structure

1. Walmart has advanced IT systems to facilitate the processes. The systems connect all internal value streams such as procument /sales /warehouses etc. and also system enables external manufacturing partners also to have data and information.

2. Work through a regional office (global merchandising centre) is a key highlight because that helps them to get a productive output and to overcome geographical distance, cultural difference, logistic complexities, better negotiations etc.

4 Strategic partnerships with suppliers is also a key highlight discovered from the research. Wall mart has supplier development programs, supplier engagement programs and also works as join improvements with suppliers

5 Walmart also trying to connect supply chain practises to position themselves high with regard to the sustainability discussion. They have been working with slogans Made in

USA by encouraging the USA suppliers by paying an upcharge. Also they market a lot in them cooperate website about sustainability and sustainable sourcing.

3.6.2.2 Product development

Walmart is a retailer so product development is not a key activity in their business model. It is about the sourcing. However, Walmart have own label ranges which heavily undercuts the branded substitutes through their margins. And it is a key challenge for the brands too.

3.6.2.3 Manufacturing

1. Walmart promotes internal and regional sourcing. This helps them to reduce the complexities in managing the supply chain too.

3. Walmart uses Vendor managed inventory strategy with key suppliers and it helps to efficiently manage the inventories and also fill rates.

3.6.2.4 Logistics

1. Walmart uses cross docking as a successful practise for warehouse and logistics management
2. Also Walmart follows the practise of direct dispatching to stored directly from suppliers/vendors
3. Walmart uses 3PL services for efficient logistics management.

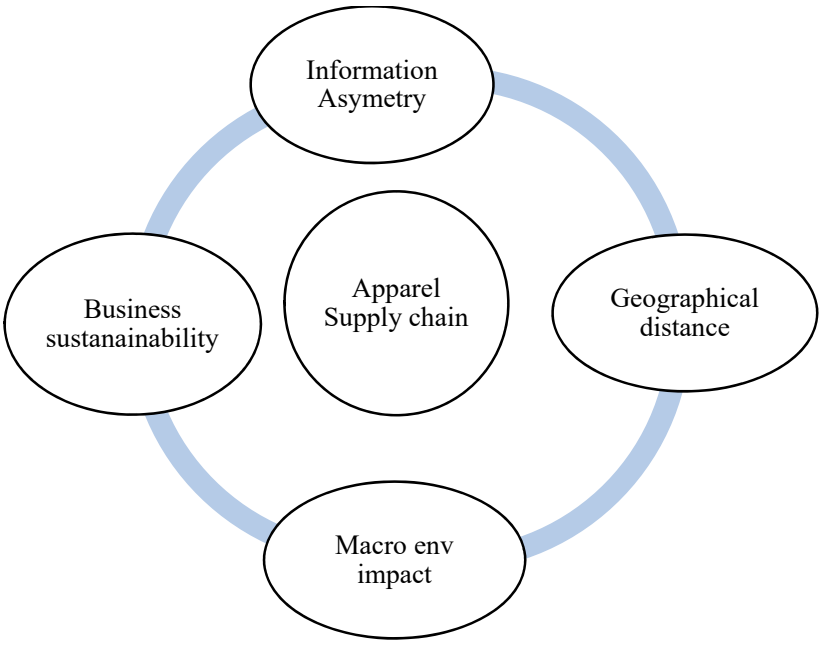
3.7. Focus group interviews/discussions

This exercise was carried out to give more customization to the research. Literature survey identified studies done for supply chains in general but this particular research is about identifying the supply chain strategies best suited for apparel industry. So having some interviews with industry professionals and discussing the issues current apparel industry is facing and also screening possible practical solutions may help to bridge the gap between the general data and the specific concerns apparel industry has. And this would help to bring in a better context when sending the questionnaire to the wider audience too.

3.8. Semi structured interviews

On this task, author identified key main impeding elements for current supply chains through his own experience and observations in the apparel industry and though internet articles, blogs, books and through informal knowledge.

Figure 3.10 – Key issues in apparel supply chain



Source: Author

Then those elements were deeply discussed by further detailing and segregating the impact of each.

Table 3.3 – Key issues in apparel supply chain

Key issue	Main elements of the issue	Impacts
Information asymetry	Forecast errors/Bull whip effect etc	Excess ordering/liabilities
	Higher inventory requirement	Holding costs /obseletions
	Increased lead times (buffers)	Cost of time/cash flow
Geographical distance	Cultural differences with new manufacturing partners	Language barriers
		Communication barriers
		Trust in communication
		Time barriers
	Less visibility on manufacturing process	Number of intermediaries
		Third party auditors
		Third party testing
	New infrastructure and overhead requirements	Central DC s
		Advanced ware housing systems
		Additional members to make sure compliance /safety / certifications
	Longer lead times	Less flexibility
		Cost of time/cash flow

Key issue	Main elements of the issue	Impacts
Business sustainability	Opportunity cost	Missing new trends like MADE IN USA/UK / Missing sort term trends
		Missing government subsides / financial motivations
		Brand perception
	Risk of future changes in supply chains towards sustainable designs	Emphasis on Carbon emission/Sustainable sourcing/ Ethical sourcing / re-using/re-cycling
	Less product knowledge inside	less capabilities inside specially for product design / Education system
Macro environment impact	Key developments in political and macro environment arena	Political instability
		Exchange rate fluctuation
		Legal barriers
		Tax and quota concerns
		Global developments in freight

Source: Author

After that the actions currently used by brands and potential solutions were also discussed. Two scenarios were discussed here as ideal state solution and current best / potential solutions.

Table 3.4 – Available possibilities

Impacts	**Ideal state solution**	**Current best possible solution/s**
Excess ordering/liabilities	Made to order	Reduce lead time / material and *style* standardization/ Postponement/integration
Holding costs /obseletions	Zero inventory	VMI (vendor managed inventory) /Direct dispatch for online
Cost of time/cash flow	Zero buffers /idling time	Reduce lead time / material and style standardization/integration
Language barriers	Internal manufacturing	Regional offices / Advanced information system /standardization of work
Communication barriers	Internal manufacturing	
Trust in communication	Internal manufacturing	
Time barriers	Internal manufacturing	
Number of intermediaries	Internal manufacturing	Regional offices
Third party auditors	Internal manufacturing	Partnerships with the manufacturers/ partnerships with mills/integration
Third party testing	Internal manufacturing	
Central DC s	Made to order	VMI (vendor managed inventory) /Direct dispatch for online /Cross docking
Advanced ware housing systems	Zero inventory	
Additional members to make sure compliance /safety / certifications	Internal manufacturing	Partnerships with the manufacturers/ partnerships with mills
Less flexibility	Internal manufacturing	Product portfolio management/Freight options
Cost of time/cash flow	Zero buffers /idling time	Reduce lead time / material and style standardization
Missing new trends like MADE IN USA/UK / Missing sort term trends	Internal manufacturing	Sourcing options / product portfolio management
Missing government subsides / financial motivations	Internal manufacturing	Sourcing options / product portfolio management

Impacts	Ideal state solution	Current best possible solution/s
Brand perception	Internal manufacturing	Branding options (Marry supply chain and branding strategy in the best efficient manner)
Emphasis on Carbon emission/Sustainable sourcing/ Ethical sourcing / re-using/re-cycling	Internal manufacturing	Sourcing options / product portfolio management
less capabilities inside specially for product design / Education system	More technical exposure and training for front end teams	Regional offices (core knowledge management)/Partnerships with the manufacturers/ partnerships with mills
Political instability	Internal manufacturing	Review the best supply chain model (Countries/factories/regions/supplier selection)
Exchange rate fluctuation		
Legal barriers		
Tax and quota concerns		
Global developments in freight		

Source: Author

From the information gathered it was visible that there are common solutions which are remedies for more than issues. So as the next step the solutions/options gathered were refined by avoiding doubling and by regrouping in to specific functional business areas.

Table 3.5 – Supply chain related options

Supply chain related options	Area
Reduce lead times (Development Process)	Product development

Material and style standardization (product design)	
Reduce lead times (execution)	Operations
Postponement	
VMI (vendor managed inventory)	
Supply chain integration	
Direct dispatch for online orders / vendor managed warehousing	
Cross docking	Logistics
Freight options	
Partnerships (3PL	
Regional offices	Process
Advanced information system	
Standardization of work	
Core knowledge management	
Branding options (Marry supply chain and branding strategy in the best efficient manner) Partnerships with the manufacturers/ partnerships with mills /Partnerships with sales channel members	Business strategy
Review the best supply chain model (Countries/factories/regions/supplier selection)	Supply chain design

Source: Author

3.9. Structure of the questionnaire - phase 2

As discussed above a set of current and potential strategic options were identified from 3 routes and below is a chart with all the options.

Table 3.6 – Supply chain related options

Literature survey commonly for supply chains across all the industries	**Current best practises pertaining to apparel industry**	**Discussions with professionals in the apparel sector**
Advanced IT systems	ERP systems / connecting suppliers through extranet	Standardized work practises
Strong Supply chain coordination's	Managing the right supplier portfolio against the product mix	Advanced IT systems
Strong partnerships with suppliers	Key strategic partnerships with suppliers	Work through regional offices
Simplification and standardization	Out sourcing of sub functions and focus on core strengths (Ex- Product design /Branding /Marketing)	Knowledge management
Vendor managed inventory	Vendor managed inventory	Supply chain integration
Vendor managed ware housing	3PL partnerships	Reduce development lead time
Cross docking	Cross docking	Reduce production/process lead time

Literature survey commonly for supply chains across all the industries	**Current best practises pertaining to apparel industry**	**Discussions with professionals in the apparel sector**
Transhipments	Backward integration	Vendor managed inventory
3rd party service providers for logistics	Nearshore manufacturing	Vendor managed ware housing
Reduce lead times		Cross docking
Reduce lead times		Port splitting
Supply chain coordination		Core knowledge management
		Style standardization /Material standardization
		Branding options (Marry supply chain and branding strategy in the best efficient manner)
		Review the best supply chain model (Countries/factories/regions/supplier selection)

Source: Author

Through the evaluation of strategic options from 3 routes. Few strategies were identified as Key supply chain infrastructure. Because these were disclosed as key strategic options in literature survey in general across all the industries and also these practises were apparent in best performers identified though financial data analysis exercise too. In addition, these were concurrently identified as possible approaches to overcome current issues in supply chain of apparel sector by apparel industry professionals too. Therefore, is can be argued that these factors have become generic norms in apparel supply chain management.

Table 3.7– Supply chain management

Common Business strategies	Branding options (Marry supply chain and branding strategy in the best efficient manner)
	Partnerships with the manufacturers
	Partnerships with material suppliers
	Partnerships with sales channel members
Common Business processes	Regional offices
	Advanced information system
	Standardization of work
	Core knowledge management

Source: Author

Thereafter below strategies were identified as strategic tools and as potential areas to include in a questionnaire to ask apparel industry professionals on how they perceive the importance or the applicability for specific business environment

3.10 List of areas in the questionnaire

Below strategic options were refined to be used for the questionnaire. Each point relates to a particular value chain area.

Table 3.8– List of areas in the questionnaire

Product development		Reduce lead times (Dev Process)
		Material and style standardization (product design)
Operations - Manufacturing		Supply chain integration
		Reduce lead times (execution)
		Postponement
		VMI (vendor managed inventory)
		Direct dispatch for online orders / vendor managed warehousing
Operations -Logistics		Warehousing options (Cross docking)
		Freight options (Air freight)
		Logistic Partnerships (3PL partners /4PL partners)
Supply chain design	**Countries/region**	Near shore manufacturing
	Supplier strategy	Limited number of key suppliers
		Vendor own sourcing for all the materials
		Vendor own sourcing for trims
	Vendor	Limited number of vendors based on product expertise

Source: Author

3.11 Structure of the questionnaire - phase 2

3.11.1 Research questionnaire finalization

As discussed in the previous section, the research studied about the previous studies identifying the best supply chain strategies. There were many research papers which brought in frameworks to manage supply chains in general based on product types, demand patterns, on the product life cycle stage, customer requirement and business requirement etc. Objective of the research questionnaire is to get the opinion from apparel industry supply chain and product development professionals about how they view these strategic options' applicability.

It obviously doesn't make sense to question them about the applicability of these options without a context because all of these are feasible options and that's is why those were shortlisted through literature survey and through focussed group interviews.

Therefore, two simple case studies were created considering the areas identified through the literature survey. With regard to apparel sector the key difference between the two were one being BASIC /CORE ranges and the other being fashion ranges.

Table 3.9– Scenarios key findings

Key aspects	**Scenario 1**	**Scenario 2**
Product complexity	Less complicated / Basic products	Comparatively complex
Volumes	High	No big volumes
New features	Same product running for several seasons	More new features
Margins	Low margins	High margins

Key aspects	Scenario 1	Scenario 2
Margin deviations	Consistent / Less deviations from estimations	Largely varies
Key requirement	Efficiency/ low cost	Availability /Fast response
Lead times	Longer lead times	Tight timelines

Source: Author

Through this respondent can rate the strategic options based on the product and business requirement and thus the data analysis will disclose how the apparel industry professionals believe or perceive the applicability of the general strategies in particular to their industry.

3.12 Case study 1

Brand X is a one of the ***leading fashion retail clothing brand*** in a ***developed country*** where consumer behaviour/buying patterns and price ranges are similar to Europe and USA and other developed countries**.** Brand X is ***sold through their own stores as well as wholesale and online channels***. Similar to most cases this brand also uses ***off-shore manufacturing*** in some Asian countries.

Brand X has some volume based ranges which run throughout the year and seasonal ranges which changes every quarter. Most of the Volume based ranges are in the ***mature stage*** of ***Product Life Cycle*** but sometimes can be developed as a ***volume driven range from the product development itself***. ***Demand /Margins*** of these ranges are ***comparatively predictable and consistent*** (Less deviations from estimated) as well.

The basis of these ranges is the scale and efficiency. They achieve the margins through manufacturing efficiency and economies of scale though the growth is marginal. Therefore, from a business point of view, ***increasing efficiency across the supply chain*** is key.

Below are some areas through which brand X can design the supply chain to be ***effective*** and ***efficient*** in managing the volume based ranges explained above. Please rate your opinion considering the above context.

3.13 Case study 1I

Brand X is a one of the ***leading fashion retail clothing brand*** in a ***developed country*** where consumer behaviour/buying patterns and price ranges are similar to Europe and USA and other developed countries**.** Brand X is ***sold through their own stores as well as wholesale and online channels***. Similar to most cases this brand also uses ***off-shore manufacturing*** in some Asian countries.

Brand X has some volume based ranges which run throughout the year and seasonal ranges which changes every quarter. These seasonal ranges are developed with a dedicated design/product development team. Brand attains the ***differentiation*** in these ranges through innovativeness. This can be in ***colour/prints /shape/pattern/materials /product performance etc***.

Seasonal developments generally yield better margins. However, ***demand and margin variations from estimates are always high.***

The key success factors for these ranges are ***reacting fast to fashion /colour themes***, Product ***innovativeness*** / ***fast replenishments***. Price is still key however above factors may help to exploit the demand at the peak and achieve better margins (with no discounts/mark downs etc.). Therefore, from a business point of view, ***increasing agility across the supply chain*** is key.

Below are some areas through which brand X can design the supply chain to be ***effective*** and ***efficient*** in managing the volume based ranges explained above. Please rate your opinion considering the above context.

3.14 Implementation

A google form was created with the two different scenarios and the requests were sent to the identified people through e mails. Sample selection can be stated as random because there was no specific selection when sending the scenarios.

Since this gathers data on specific area the questionnaire has to be sent to a particular segment which is professionals working in any entities of apparel retail supply chain. However even in that the employees in administration /HR or other supporting services will

not have a clear sense to share a qualitative feedback here. Therefore, the questionnaire was sent to a specific segment as

Scope – Professionals in apparel industry engaged in supply chain/product development / Marketing & retail / process improvement etc.

3.15 Strategies for error control

As discussed in above chapters' certain measures were taken to avoid anticipated errors in particular areas.

Table 3.10– Risk management

Anticipated error /Risk	**Measures taken**
Questionnaire containing obvious and non-questionable points to rate	Work through 3 routes and identity the obvious areas and avoid them from questionnaire
Vague questions which are unanswerable without knowing other background details	Creating two case studies so that respondents can rate with a background and with a proper sense
Getting neutral answers which makes it difficult to analyse and interpret	Create a scale of 1 to 7 instead of 1 to 5
Respondents become bias when asked to rate the same questions twice although for two scenarios	Send one scenario only to one person
Respondents become lazy when questionnaire takes long time and then answers doesn't reflect the true opinions	Make the questionnaire shortest as possible and simple

Source: Author

3.16 Data analysis

This section briefly discusses about how the data outputs going to be used and in which ways. It is very important to have a projection of what the questionnaire will collect in terms of information and also how the data output will be used towards the final goal.

3.16.1 General information /Basic detail gathering

Table 3.11 – General information /Basic detail gathering

Question	Answers	Reason
Gender	Male/ Female	To see if there is any relation between gender and how they perceive supply chain efficiency
Country /Region	1. Asian sub -continent 2. Far- east Asia 3. Asia Pacific 4. Europe and USA	To see the differences of response in regions (supply chain wise)
Sector / Position in Supply chain	Manufacturing / Intermediate service / Retail	To see the differences in response along supply chain
Work experience	0-5 / 5-10 / Above 10	To review the responses with the experience level (may be weigh the ratings)
Brands dealt with	Names	To review the exposure

Question	Answers	Reason
Position in the company	Junior level/Middle management /Senior management	To review the responses with the decision making level and cross functional knowledge (may be weigh the ratings)
Department /section	1. Operations/Supply chain/logistics 2. Design & Product development/Marketing/Sales /brands /merchandising 3. Support services (Finance /IT/HR/ADMIN etc.)	To review the responses with the working department/section and to make sure the respondents are in the expected sample segment

Source: Author

3.16.2 Answers from general questionnaire

The objective of this research is to identify the right mix of leanness and agility in the supply chain for a fashion retail brand. As discussed in the previous chapters there are lot of research studies to understand which general strategy suits for a particular business model but little has been studied in to the context of what strategic options are suitable. On the other hand, there was hardly any researches or studies done specifically on apparel retail business in this regard.

Therefore, the questionnaire gathers employee's perception based on two different product lines and the results will give an indication as to how supply chain options needs to be integrated to different product lines/categories and thus to overall supply chain strategy.

Table 3.12 – Supply chain options integration based on different product lines/categories

	Core Ranges	***Average***	***Std Dev***	***Seasonal Ranges***	***Average***	***Std Dev***
Common Business strategies	Branding options (Marry supply chain and branding strategy in the best efficient manner)					
	Partnerships with the manufacturers					
	Partnerships with material suppliers					
	Partnerships with sales channel members					
Common Business processes	Regional offices					
	Advanced information system					
	Standardization of work					
	Core knowledge management					
Product development	Reduce lead times (Dev Process)			Reduce lead times (Dev Process)		
	Material and style standardization (product design)			Material and style standardization (product design)		
	Supply chain integration			Supply chain integration		
	Reduce lead times (execution)			Reduce lead times (execution)		
	Postponement			Postponement		

Operations - Manufacturing		VMI (vendor managed inventory)			VMI (vendor managed inventory)		
		Direct dispatch for online orders / vendor managed warehousing			Direct dispatch for online orders / vendor managed warehousing		
Operations -Logistics		Warehousing options (Cross docking)			Cross docking		
		Freight options (Air freight)			Freight options (Air freight)		
		Logistic Partnerships (3PL partners /4PL partners)			Partnerships (3PL partners /4PL partners)		
Supply chain design	***Countries/region***	Near shore manufacturing			Near shore manufacturing		
	Supplier strategy	Limited number of key suppliers			Limited number of key suppliers		
		Vendor own sourcing for all the materials			Vendor own sourcing for all the materials		
		Vendor own sourcing for trims			Vendor own sourcing for trims		
	Vendor	Limited number of vendors based on product expertise			Limited number of vendors based		

					on product expertise		

Source: Authors

So based on the ratings (considering the mean, std dev and other statistical data) a model was to be developed which are two distinct supply chain strategies for basics and seasonal ranges however considering the fact that the overall supply chain should be an integrated model which aligns with the cooperate strategy and the business goals.

Chapter 4

RESEARCH FINDINGS AND DATA ANALYSIS

4.1 Introduction

The previous two chapters complied a detailed discussion on literature survey followed by a theoretical analysis of the research design. This chapter brings an analysis of the data gathered through the research. The chapter will first visualize the background of the respondents to understand the validity of the information to the context. The nest part will summarize the research questionnaire data in details.

4.2 Data Screening

4.2.1 General information analysis

As mentioned in the 3rd chapter, data /information was gathered in the context of 2 case studies. 40 respondents were collected for each questionnaire.

General information of the respondents was gathered so as to justify the information validity and to visualize the context of the picture derived by the data.

4.2.2 Gender

Gender details were gathered to see if there is any difference between the perceptions towards the strategic elements. The research was sent randomly with our considering the gender. However, the counts were finally close.

Table 4.1 – Respondent based on gender

	Basic	Seasonal	Total
Female	***22***	***16***	38
Male	***18***	***24***	42

Source: Author

However, after the analysis there was no significant difference between how they have rated.

Table 4.2 – Analysis of Question responses based on gender

Question	*Basic*		*Seasonal*	
	Male	*Female*	*Male*	*Female*
Reducing lead time of the product development/design process is important			5.79	5.82
Material standardization in the product development phase is important	5.95	6.03	5.90	5.92
Style/shape standardization in the product design phase is important	5.35	5.32	5.54	5.51
Postponement in product development is important	4.2	4.35	4.28	4.23
Manufacturing postponement is important	5.28	5.42	4.77	4.72
Vendor managed inventory is important	5.45	5.42	5.13	5.13
Vendor managed warehousing is important	5.28	5.03	4.92	4.92
Backward Integration is important	5.18	5.10	4.85	4.90
Logistics Postponement is important	5.05	5.10	4.82	4.85
Warehousing options (cross docking/port splitting) is important	5.5	5.32	5.28	5.31

Logistics partnerships (3PL/4PL) is important	5.23	5.10	5.31	5.31
Near shore manufacturing/sourcing is important	5.2	5.19	5.28	5.23
Working with FEW key strategic suppliers/vendors is important	5.83	6.03	5.69	5.69
Connecting with ALL upstream partners (brand does all the product development and design for all the materials) in the supply chain is important	5.40	5.39	4.82	4.82
Vendor is given the responsibility to manage the entire upstream supply chain is important	5.23	5.23	4.85	4.85
Vendor is given the responsibility to manage selected parts of the supply chain only (non-strategic materials, e.g. generic trims) is important	5.33	5.45	4.49	4.46

Source : Author

4.2.3 Age

Age can important in two things. To make sure that the respondents consist from a mature crowd who can bring in an opinion and on the hand it is important to make sure the age distribution is balanced so that doesn't skewed due to the differences in perception over the age. According to the table it is clearly visible that the bulk of the data (90%) is from 26-45 range and not skewed to very young or too older age ranges.

Table 4.3 – Age distribution of the respondents

Age	***Count***
18-25	1
26-35	44

36-45	28
46-55	7
Total	80

Source : Author

4.2.4 Experience

Experience was critical to justify that the respondents carry a substantial experience to share a strategic opinion.

Table 4.4 – Age distribution of the respondents

Years	Count	Percentage
1 to 2	5	6%
2 to 5	14	18%
5 to 10	22	28%
10 above	39	49%
Total	80	100%

Source : Author

According to the above table 50% of the respondents are more than 10 years experienced. Also 80% are more than 5 years experienced. The balance 20% from less than 5 years are also important because they will also impart opinions with more new knowledge, experience and exposure opposed to experienced individuals.

4.2.4.1 Countries worked in

This information was vital to understand the background of the respondents and also to make sure that the responses carry a widespread background. Apparel industry is one of the most globalized and dynamic industries in the world. The apparel supply chain in general has roots all across the world. So it was vital to have respondents from different parts of the world so this research has taken an intentional effort to gather response across many regions as practical.

Firstly, the questionnaire ascertained about the countries they have worked more than 5 years. And there were 82 count with 5 or more work experience. And the list consists of 7 countries.

Table 4.5 – Countries respondents have worked more than 5 years

Australia	17
China	9
HKG	12
SL	38
Indo	5
USA	1
Total	82

Source : Author

Further there was a count of 100 for the countries they have worked in. And it consists of 12 countries. Also it covers all the regions as Asia, Far East Asia, Europe, USA, Pacific region etc. This is a good indication and confirmation that the experience and the exposure the respondents carry so that it assures a sound picture in the results.

Table 4.6 – Countries respondents have worked

Australia	19
China	10
HKG	14
SL	38
USA	8
UK	1
Vietnam	1
Indonesia	5
Netherland	1
Japan	1
Germany	1
Thailand	1
Total	100

Source: Author

4.2.4.2 Position in the company

This is significant to understand how capable are they to share a strategic opinion and also if they get to involve in strategy formulation in business.

Table 4.7 – Countries respondents have worked

Department	Total	Percentage
Entry	13	16%
Middle M	41	51%
Upper	23	29%
Top	3	4%
Total	80	100%

Source: Author

As the details, 80% are from middle and upper management levels which imply the fact that the data are stemmed from an experienced and hands on professionals.

4.2.4.3 Department

It is an obvious fact that people and their response can be biased to the department they work or to the experience they have. So it was important to make sure respondents consist from all the departments. As highlighted in the research methodology chapter, the questionnaire was sent to only product development, marketing, operational and supply chain and few individuals in are process improvement job roles since they also have the exposure across all the functions in the business.

Table 4.8 – Departments respondents work

Department	Count	Percentage
Design PDC	41	51%
Ops/sup	25	31%
Support	7	9%
Marketing	7	9%

Source: Author

4.2.5 Sectors in the apparel chain

Since this is an analysis about the apparel supply chain it was important to have respondents covering across all the supply chain segments. It is obvious in the chart that respondents are coming from all the segments and have more number covering retail and manufacturing which are the main elements.

Table 4.9 – Segments in supply chain respondents consist of

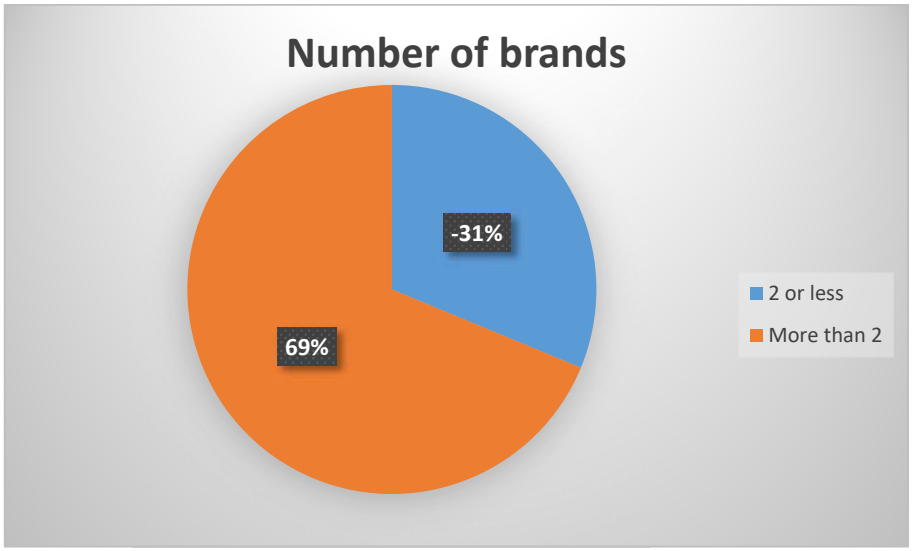
Segment	Total
Intermediary	5
Retail	24
Manufacturing	41
Service/other	10
Total	80

Source: Author

4.2.6 Brands respondents have worked for

Since this is a research on apparel supply chains, it was crucial to have respondents who has worked for different brands from different regions, countries which carries different business models and caters to different customer segments. The idea was that they will have the experience and exposure to their business models and thus on the supply chains so that they could include them in their responses.

Figure 4.1 Brands respondents have worked for



Source: Author

According to the data analysis 70% of respondents have worked for more than 2 brands which is a great indication of the background they have brought in to the response and thus to the analysis.

Also respondents are coming from 120 different brands predominantly from Europe, USA and from all across the world. These respondents will reflect the exposure of supply chain, operational structures, strengths, weaknesses and new strategies they use currently. Therefore, in a way the research can be presented as an analysis drawn through the strategic analysis of 120 brands.

4.3 Questionnaire data analysis

Questionnaire was segmented in to 4 categories for easy reference and analysis.

1. Product development
2. Operations and manufacturing
3. Logistics
4. Sourcing/Supplier selection

1.3.1 Product development

Questionnaire included 4 key areas related to product development phase. Reducing lead times in product development for basic ranges was not really applicable so it was not considered for the questionnaire.

Material /style standardization had been considered as a key point by for both basic and fashion ranges. And the standard deviation was remarkably low which means the consideration is very high and at the same time more consistent.

Table 4.10 – Questionnaire analysis (product development)

Question	***Basic***		***Seasonal***	
	Average	***Std dev***	***Average***	***Std dev***
Reducing lead time of the product development/design process is important			5.8	1.7
Material standardization in the product development phase is important	6.0	1.0	5.9	1.3
Style/shape standardization in the product design phase is important	5.4	1.4	5.5	1.3
Postponement in product development is important	4.2	1.6	4.3	1.7

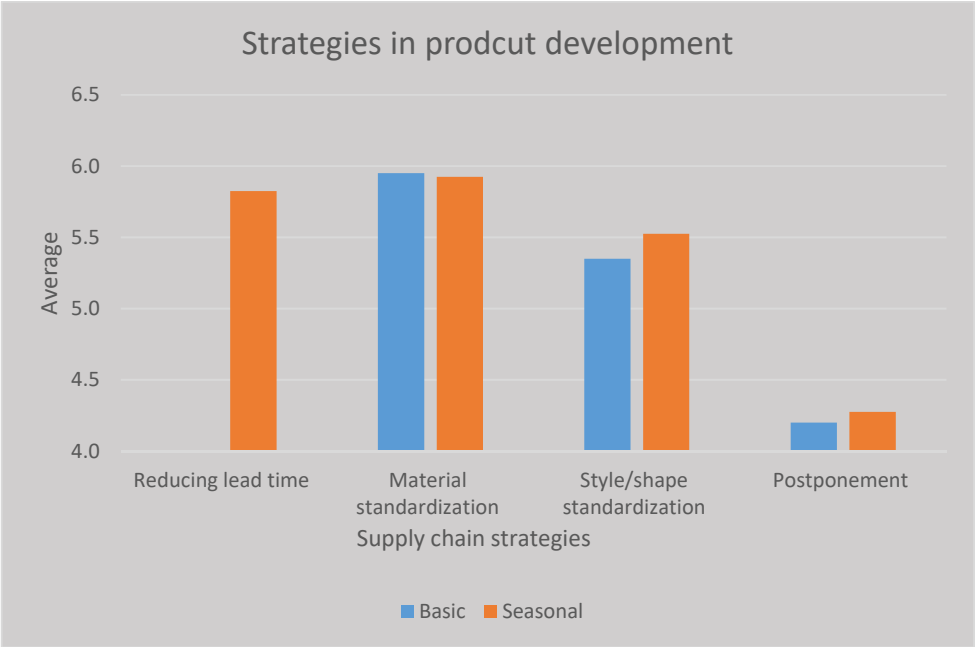
Source: Author

Reducing lead time for the product development process has been averaged very high as a strategy however the standard deviation is high. This implies the fact that some still believes squeezing timelines might effect on the product quality.

Postponement in product development has not embraced by the respondents compared to other options as a strategy. And standard deviation is also high which means people have different thoughts on that.

Below is a graphical representation of the average values for easy understanding.

Figure 4.2 Brands respondents have worked for



Source: Author

1.3.2 Operations

Manufacturing postponement has been identified as key for basic ranges however doesn't seems to be a vital factor as per the respondents. Vendor managed warehouse and vendor managed inventory has been rated as high important factors to enhance supply chain productivity for both seasonal and basic orders.

Backward integration has not received much acceptance from them and especially they have considered backward integration comparatively less important factor as far as seasonal ranges are concerned.

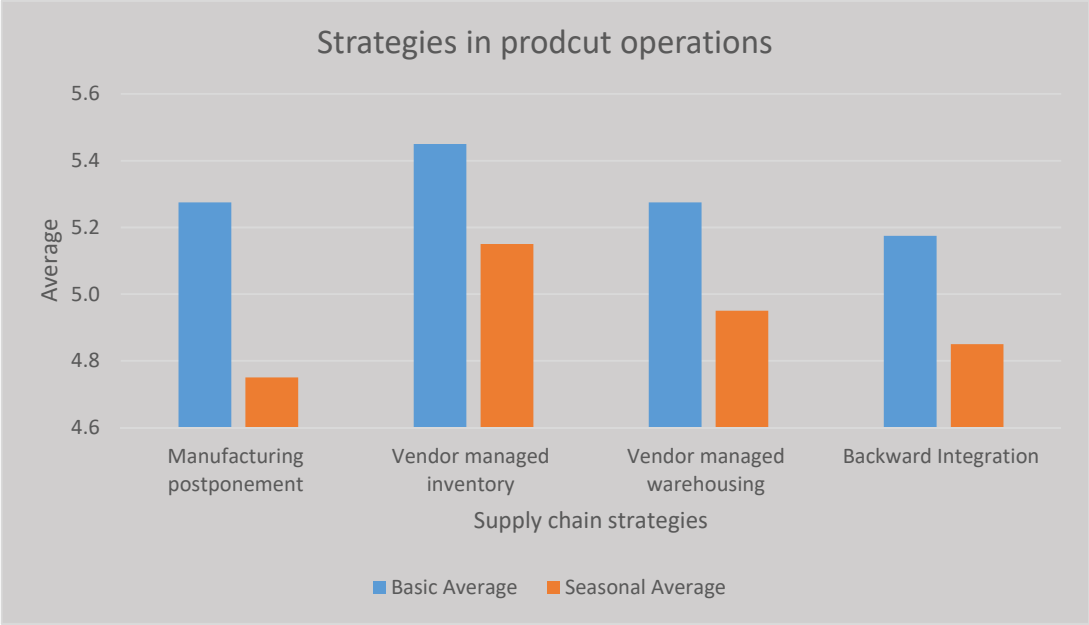
Table 4.11 – Questionnaire analysis (Operations)

Question	*Basic*		*Seasonal*	
	Average	*Stud dev*	*Average*	*Std dev*
Manufacturing postponement is important	5.3	1.6	4.8	1.7
Vendor managed inventory is important	5.5	1.2	5.2	1.7
Vendor managed warehousing is important	5.3	1.4	5.0	1.5
Backward Integration is important	5.2	1.2	4.9	1.4

Source : Author

Below is a graphical representation of the average value ratings for easy reference.

Figure 4.3 Questionnaire analysis (Operations)



Source : Author

4.3.3 Logistics

Below are how respondents have perceived the importance of logistic strategies in the context of basic and seasonal ranges.

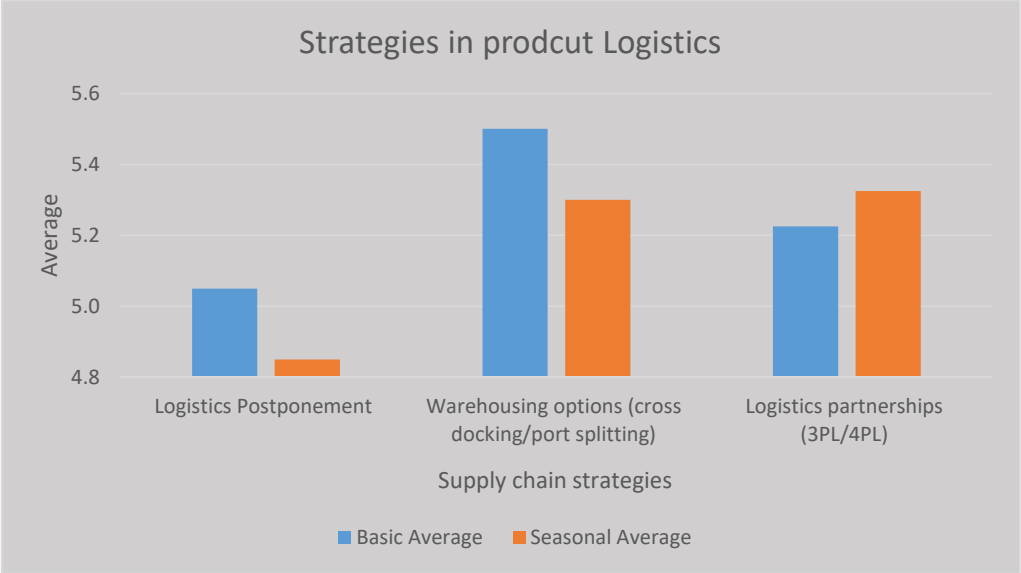
Table 4.12 – Questionnaire analysis (Logistics)

Question	***Basic***		***Seasonal***	
	Average	***Std dev***	***Average***	***Std dev***
Logistics Postponement is important	5.1	1.4	4.9	1.5
Warehousing options (cross docking/port splitting) is important	5.5	1.0	5.3	1.1
Logistics partnerships (3PL/4PL) is important	5.2	1.3	5.3	1.4

Source: Author

Warehousing options such as cross docking and port splitting have been identified as very important so does logistic partnerships. Logistics postponement is not regarded as much as important as other two. But still can be regarded as options since the rating already high.

Figure 4.4 Questionnaire analysis (Logistics)



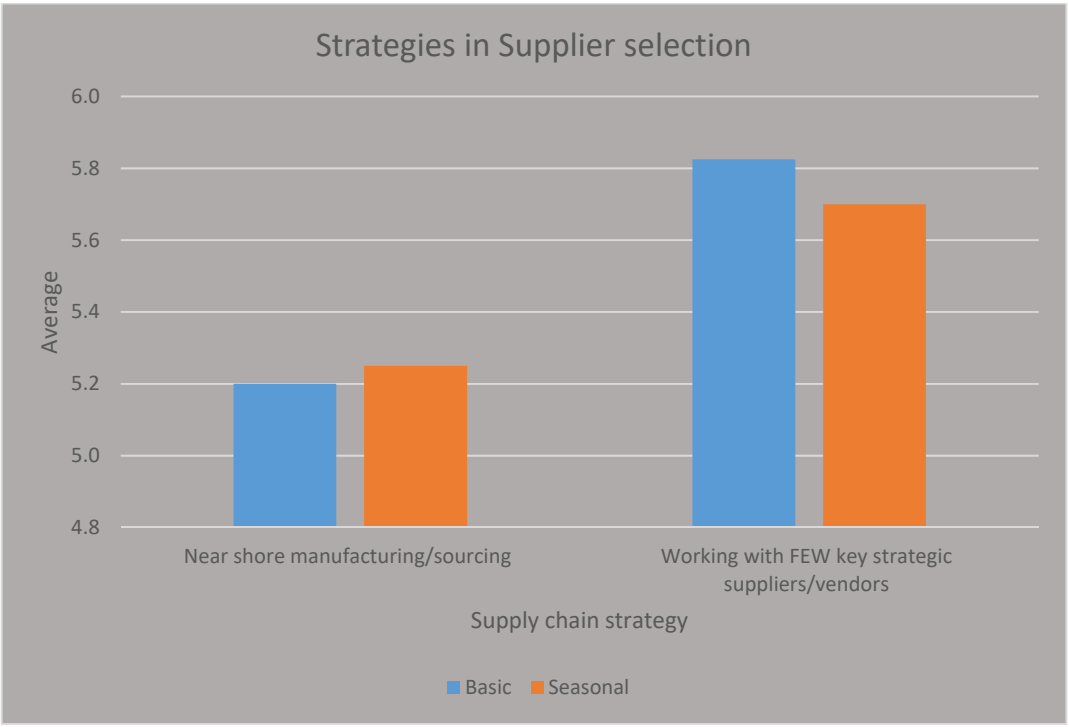
Source: Author

4.3.4 Sourcing /supply chain

Working with few key strategic suppliers have been identified as extremely important irrespective of the product range.

However the emphasis on Nearshore manufacturing is not very high compared to others. And doesn't show any difference on the range. It seems professionals still trust logistic options to cope with geographical distance rather than trying to re-design the supply chain for shooter distant options.

Figure 4.5 Questionnaire analysis (Sourcing)



Source: Author

When it comes to supplier engagement, 3 parallel options were questioned to ascertain how they perceive the importance of each against different product ranges.

All 3 have been rated high which justify the fact that all 3 are considerable options for a company to exploit. However, when analyzed deeply with figures respondents have considered a two separate options for basic and fashion ranges. (When both average and std deviations are considered)

Table 4.13 – Questionnaire analysis (Sourcing)

Question	Basic		Seasonal	
	Average	Std dev	Average	Std dev
Connecting with ALL upstream partners (brand does all the product development and design for all the materials) in the supply chain is important	5.4	1.5	4.9	1.6
Vendor is given the responsibility to manage the entire upstream supply chain is important	5.2	1.5	4.9	1.4
Vendor is given the responsibility to manage selected parts of the supply chain only (non-strategic materials, e.g. generic trims) is important	5.45	1.5	4.5	1.7

Source: Author

Seasonal ranges – Brand involves in the material development for strategic materials and let vendors handle the generic/non-strategic items like small trims

Basic ranges – Vendor is given the responsibility to handle all the material management.

Figure 4.5 Questionnaire analysis (Sourcing)

Source: Author

However when considered the overall effort and leveraging on volumes, may be brand involving in materials developments can also be a fruitful option. Because if a brand involve is material developments for seasonal ranges, they need resources for that and the same resources can be utilized for developments for basic ranges as well. So that is something a company could decide based on their specific context and the selection can be subjective.

Chapter 5

CONCLUSION

5.1 Introduction

As discussed in above chapters two scenarios were identified and the applicability of the strategic elements were rated through the questionnaire. Chapter 4 consist of the research data analysis.

Firstly, this section is an analysis of the general data. A detailed analysis of how the responses differ based on their sex, age, supply chain segment, status in the hierarchy, experience etc.

Secondly the mean and the standard deviation of the ratings of the responses were analyzed. This chapter discusses the findings and thus a discussion from those findings.

5.2 Summary of research finding

Research data analysis was the key part in the data analysis. It was mainly identified through 4 segments

5.2.1 Product development

As far as the product development is concerned, reducing lead time is critical for seasonal ranges but obviously it is not related for basic ranges. Material and product standardization has been rated with extraordinary acceptance for both ranges. Postponement had not been accepted as potential strategy. May be because of the fact that it requires a strong supply chain and product development arm with big order volumes to execute such a strategy so many be it is not applicable for most of the brands the respondents associated with. And standard deviation is also high which means people have different thoughts on that.

5.2.2 Operations

Manufacturing postponement has been identified as key for basic ranges however doesn't seems to be a vital factor as per the respondents. Vendor managed warehouse and vendor managed inventory has been rated as high important factors to enhance supply chain productivity for both seasonal and basic orders.

Backward integration has not received much acceptance from them and especially they have considered backward integration comparatively less important factor as far as seasonal ranges are concerned. Backward integration is not a popular strategy in current business strategies. However, there is no right or wrong strategy as such. And some companies are still deploying this and they have been successful as well.

5.2.3 Logistics

Warehousing options such as cross docking and port splitting have been identified as very important so does logistic partnerships. Logistics postponement is not regarded as much as important as other two. But still can be regarded as options since the rating already high.

5.2.4 Sourcing and supply chain

Working with few key strategic suppliers have been identified as extremely important irrespective of the product range. Working with few suppliers gives a lot benefits such as leverage on volumes, be a strategic customer for the suppliers etc. So this seems a viable option irrespective of the product type. However, it will be comparatively less importance because seasonal ranges might use a lot of new materials and trims so sometimes working with very few suppliers might hinder the sourcing options.

However, the emphasis on Nearshore manufacturing is not very high compared to others. And doesn't show any difference on the range. It seems professionals still trust logistic options to cope with geographical distance rather than trying to re-design the supply chain for shooter distant options.

5.2.5 Supplier engagement

When it comes to supplier engagement, 3 parallel options were questioned to ascertain how they perceive the importance of each against different product ranges.

All 3 have been rated high which justify the fact that all 3 are considerable options for a company to exploit. However, when analyzed deeply with figures respondents have considered a two separate options for basic and fashion ranges. (When both average and std deviations are considered)

Seasonal ranges – Brand involves in the material development for strategic materials and let vendors handle the generic/non-strategic items like small trims

Basic ranges – Vendor is given the responsibility to handle all the material management.

However, when considered the overall effort and leveraging on volumes, may be brand involving in materials developments can also be a fruitful option. Because if a brand involve is material developments for seasonal ranges, they need resources for that and the same resources can be utilized for developments for basic ranges as well. So that is something a company could decide based on their specific context and the selection can be subjective.

5.3 Conclusion

In summary, the research analyzed the practicability of the identified strategies for apparel basic and seasonal product ranges and a general idea on two supply chain models were devised based on the strategic tools rated.

Apart from product characteristics, factors such as core competencies of the organisation, the capabilities of the supply chain members and decision drivers are significant criteria that need to be considered. Hence, there is a need for a comprehensive framework that incorporates the various aspects of determining an optimal supply chain strategy.

It is important to relook at the objectives of the study and see how the research and research analysis has helped in achieving them.

- Identify the strategic options practically related to those generic strategies

This was done through literature survey, studying best performing apparel supply chains and through focus group interviews. The gathered information was then arranged to a questionnaire survey.

- Evaluate their applicability to apparel retail supply chains

The research questionnaire was used for this.

- Formulate a supply chain model for a fashion apparel retailer brand

Below is a summery and basically a general model to understand and to integrate strategic elements to the supply chain.

Table 5.1 – Research findings

	Seasonal	Basic
Common Business strategies	Branding options (Marry supply chain and branding strategy in the best efficient manner)	
	Partnerships with the manufacturers	
	Partnerships with material suppliers	
	Partnerships with sales channel members	
Common Business processes	Regional offices	
	Advanced information system	
	Standardization of work	
	Core knowledge management	

	Seasonal	Basic
Strategic tools (With similar rating)	Working with FEW key strategic suppliers/vendors is important	
	Material standardization in the product development phase is important	
	Style/shape standardization in the product design phase is important	
	Warehousing options (cross docking/port splitting) is important	
	Logistics partnerships (3PL/4PL) is important	
	Near shore manufacturing/sourcing is important	
Strategic tools (Specific to basic/seasonal)		Manufacturing postponement is important
		Vendor managed inventory is important
		Vendor managed warehousing is important
	Vendor is given the responsibility to manage selected parts of the supply chain only (non-strategic materials, e.g. generic trims) is important	Connecting with ALL upstream partners (brand does all the product development and design for all the materials) in the supply chain is important

5.3 Suggested Model

According to the literature survey and though the studies of best performers so does through the discussions through professionals, it becomes apparent that the best supply chain model is a hybrid strategy which is also called a leagile strategy. This has been further verified through the research responses because the rating has been very close in terms of numerical values which implies that there are less distinct strategies as lean or agile but it is a close mix.

Further it is important to understand that the supply chain strategy should be shaped through numerous external and internal factors such as macro environment factors, cooperate objectives, competition, company core competencies and specially the intangible factors such as culture to be a productive and integrated strategy.

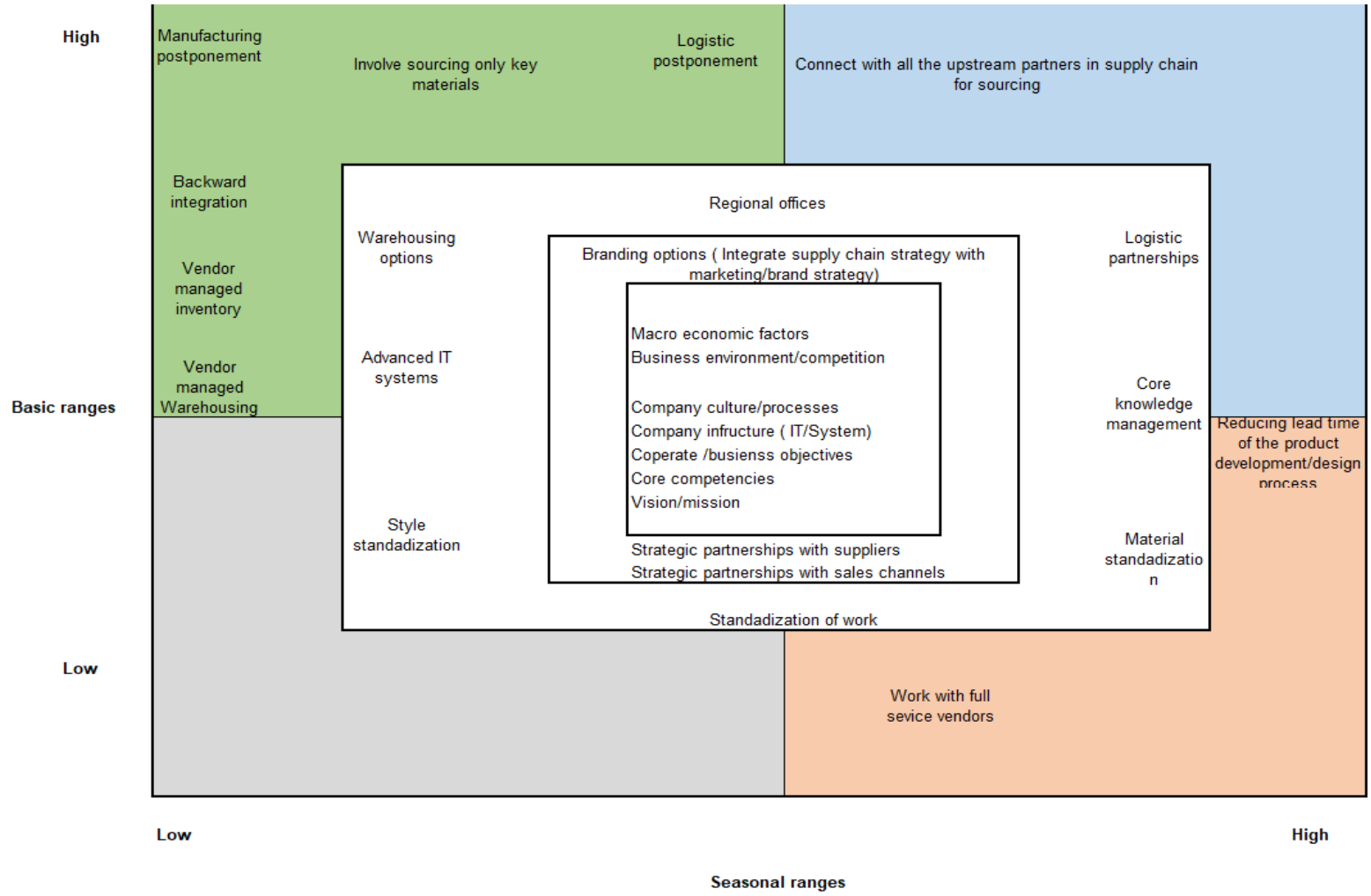
Author suggests below model in shaping a company's supply chain strategy considering all these factors.

As seen in below matrix. The key external and internal factors should be considered before shaping the supply chain strategy. Then it will be added with common business strategies irrespective of the product types. These were identified as common strategies through literatures survey, focus group interviews and best performance benchmarking. Those were found to be important for any supply chain and more of generic norms.

The 2nd layer was common business processes. This is same as the first however more than strategies these can now be identified as common business practices/processes. Some of them were identified through literature survey as the first ones and some of them were refined as common practices through the research ratings since they were all rated high and with same weight by respondents.

Outside are strategies which will be differently applicable based on the product types /range and their relative mix of volumes.

Figure 5.1 – Suggested guideline for shaping supply chain strategy



Source: Author

The dominant factor author suggest here is the relative ratio of basic to fashion ranges. For example,

Table 5.2 – Strategy analysis

% of basic ranges	% of fashion ranges	Possible business type	Supply chain strategy
More than 50%	Less than 50%	Low end apparel brands	Common strategy with more strategies elements supporting basic ranges
Less than 50%	More than 50%	High end fast fashion brands	Common strategy with more strategies elements supporting fashion ranges
Same volumes	Same volumes	Moderately positioned brand	Two separate supply chain strategies with selectively selected common strategies
Less than 50%	Less than 50%	Mote defined in mass scale business. Premier niche brands	Can't work with generic strategies. Need a business specific tailored supply chain

However, the supply chain model selection needs to be done through stringent process and continuous improvement process since it is a mix of a plethora of related factors. What can be arrived through this research is just a simple guideline.

5.4 Areas for future research

As discussed and explained above is a simple guideline and supply chain strategy formulation is a widespan process with the engagement of all the strategic decision makers and it is pretty much a company specific process.

However further researches can be suggested as

1. Deep drive and an analysis of each individual strategic options in the relation to a particular mix of a (Ex- 70% seasonal business against 30% basic)
2. How the above strategic elements can be weighted considering anticipated mac environment changes such as
    - Digitization of supply chains
    - Block chain supply chain
    - Internet of things
    - Holistic marketing and sustainability engagement
    - 3 D printing
    - Customization
3. Theoretical study on what are the critical factors for a "best supply chain ". What is the right mix of historical (financial) Vs futuristic (qualitative) factors as involvement in sustainable supply chain, fair trade, cooperate behaviors, brand strategy etc.?

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APPENDIX -1

Basic Range Questionnaire

Survey on Apparel Supply Chains

This survey is made and conducted by Mahesh Rangana Sathkoralage in partial fulfillment of the MBA in Supply Chain Management degree offered by the Department of Transport & Logistics Management, Faculty of Engineering, University of Moratuwa, Sri Lanka.

This survey is sent to you as an acknowledgement of your contribution and experience to the fashion and apparel industry. Understanding your opinions on the current state of fashion supply chain and how it should be transformed is vital for the future growth of the industry. Therefore, please take a few minutes from your valuable time and answer the following question. The entire questionnaire can be answered in 5 to 10 minutes.

Kindly note that by participating, you're giving your consent to analyse your answers for publication of the Masters dissertation and future journal and conference publications.

*Required

	Gender
	Male
	Female
	Prefer not to say
	Other

	Your age in years
	18-25
	26-35
	36-45
	46-55
	56-65
	66 and over

	Work experience throughout your career in apparel sector (in years) *
	Less than 1 year
	1-2
	2-5
	5-10

	More than 10

	Which best describes your employer in the supply chain? *
	Manufacturer
	Intermediary
	Consulting/service provider
	Retailer/brand

	Departmental/functional affiliation *
	Operations / Supply Chain / Logistics
	Design / Product Development / Sourcing / Merchandising
	Marketing / Sales / Branding
	Peripheral functions (Finance / Human Resources / IT / Administration / etc.)

	Where does your role fill in the organization's hierarchy? *
	Top/upper management
	Upper/middle management
	Middle management
	Entry level
	Hourly/casual employment

Please answer the following questions to describe the exposure you've received so far in your career.

Countries where you've lived more than 5 years in

Country you're currently based in

Countries where you've worked in

Brands you've worked with

Company X

Company X operates a leading clothing brand in a developed country. The brand sells through their own stores as well as wholesale and online channels. Similar to most cases this brand also uses off-shore manufacturing in several developing countries.

Company X has several volumes based ranges (basic or core products) which run throughout the year and seasonal ranges which change quarterly (3 months). Most of the basic ranges are in the mature stage of Product Life Cycle but can also be newly developed as a basic/volume driven range too. Demand/margins of these ranges are comparatively predictable and consistent (less deviations from estimated) as well.

The basis of these ranges is scale and efficiency. They achieve the margins through manufacturing efficiency and economies of scale though the growth is marginal. Therefore, from a business point of view, increasing efficiency across the supply chain is key.

The next questions focus on areas where the brand can design the supply chain to be EFFECTIVE and EFFICIENT in managing the volume based ranges explained above.

Please rate the applicability of the following statements on a scale of 7 with 7 being Completely Agree, Completely Disagree for the focal product., considering the above context.

1 Product Development

Material standardization in the product development phase is important *

This is to use standard materials as much as possible to achieve operational flexibility. For example, few similar fabrics/ same yarn for several fabrics, etc.

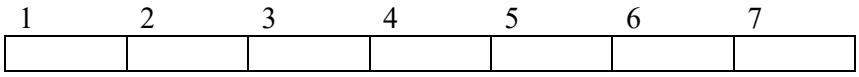
Completely disagree Completely agree

1	2	3	4	5	6	7

Style/shape standardization in the product design phase is important *

This is mostly about the shapes and pattern. It is using few key pattern blocks across the ranges where possible. E.g. - 3 key shapes for briefs/ 4 key shapes for bras / 3 key cup shapes, etc.

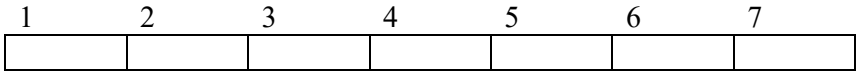
Completely disagree Completely agree



Postponement in product development is important *

This is another strategy used by some brands. Partial development happens with two or more vendors (may be with the cheapest and the fastest option / or in two regions where taxation is different) but select the final vendor very late when more information on market demand is available.

Completely disagree Completely agree

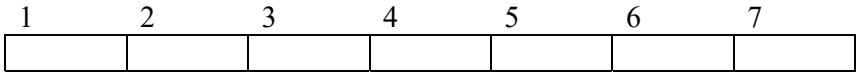


2 Manufacturing Operations

Manufacturing postponement is important *

This is another way of postponement. Customer share the forecasts in advance and then vendor can work with the suppliers and go ahead to arrange fabrics/trims for basic colours. Then the final manufacturing only happens after exact volumes are confirmed.

Completely disagree Completely agree



Vendor managed inventory is important *

Vendor has full access to the market demand data and vendor will manage production and the inventory for the buyer based on the information.

Completely disagree Completely agree

1 2 3 4 5 6 7

Vendor managed warehousing is important *

In vendor managed warehousing, vendor manages the warehousing and inventory on behalf of the brand.

Completely disagree Completely agree

1 2 3 4 5 6 7

Backward Integration is important *

This is a strategy where the brand moves to the previous (upstream) tier to own and control the backward operations.

Completely disagree Completely agree

1 2 3 4 5 6 7

Logistics Operations

Logistics Postponement is important *

This relates to having several warehouses located in different regions and decide which warehouse to use at the last moment depending on where the market demand is.

Completely disagree Completely agree

1 2 3 4 5 6 7

Warehousing options (cross docking/port splitting) is important *

These are logistic service features to reduce warehousing and internal transportation costs.

Completely disagree Completely agree

1	2	3	4	5	6	7

Logistics partnerships (3PL/4PL) is important *

3PL - Third party logistics providers: Completely separate organisations that provide logistics to manufacturers at a cost. 4PL - Fourth party logistics providers: Similar to 3PLs, but does not possess assets and operations as a high-level manager of logistics solutions.

Completely disagree Completely agree

1	2	3	4	5	6	7

3 Sourcing/supplier Selection

Near shore manufacturing/sourcing is important *

This refers to manufacturing or sourcing closer to the customers' demand nodes.

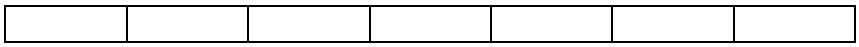
Completely disagree Completely agree

1	2	3	4	5	6	7

Working with FEW key strategic suppliers/vendors is important *

Completely disagree Completely agree

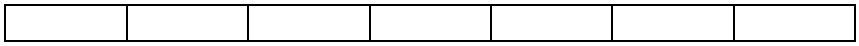
1 2 3 4 5 6 7



Connecting with ALL downstream partners (brand does all the product development and design for all the materials) in the supply chain is important *

Completely disagree Completely agree

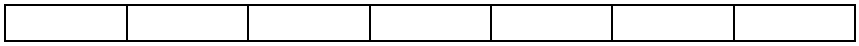
1 2 3 4 5 6 7



Vendor is given the responsibility to manage the entire upstream supply chain is important *

Completely disagree Completely agree

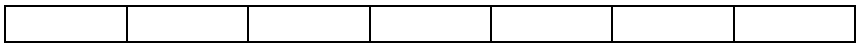
1 2 3 4 5 6 7



Vendor is given the responsibility to manage selected parts of the supply chain only (non-strategic materials, e.g. generic trims) is important *

Completely disagree Completely agree

1 2 3 4 5 6 7



APPENDIX -2

Seasonal Range Questionnaire

Survey on Apparel Supply Chains

This survey is made and conducted by Mahesh Rangana Sathkoralage in partial fulfillment of the MBA in Supply Chain Management degree offered by the Department of Transport & Logistics Management, Faculty of Engineering, University of Moratuwa, Sri Lanka.

This survey is sent to you as an acknowledgement of your contribution and experience to the fashion and apparel industry. Understanding your opinions on the current state of fashion supply chain and how it should be transformed is vital for the future growth of the industry. Therefore, please take a few minutes from your valuable time and answer the following question. The entire questionnaire can be answered in 5 to 10 minutes.

Kindly note that by participating, you're giving your consent to analyse your answers for publication of the Masters dissertation and future journal and conference publications.

*Required

	Gender
	Male
	Female
	Prefer not to say
	Other

	Your age in years
	18-25
	26-35
	36-45
	46-55
	56-65
	66 and over

	Work experience throughout your career in apparel sector (in years) *
	Less than 1 year
	1-2

	2-5
	5-10
	More than 10

	Which best describes your employer in the supply chain? *
	Manufacturer
	Intermediary
	Consulting/service provider
	Retailer/brand

	Departmental/functional affiliation *
	Operations / Supply Chain / Logistics
	Design / Product Development / Sourcing / Merchandising
	Marketing / Sales / Branding
	Peripheral functions (Finance / Human Resources / IT / Administration / etc.)

	Where does your role fill in the organization's hierarchy? *
	Top/upper management
	Upper/middle management
	Middle management
	Entry level
	Hourly/casual employment

Please answer the following questions to describe the exposure you've received so far in your career.

Countries where you've lived more than 5 years in

Country you're currently based in

Countries where you've worked in

Brands you've worked with

Company X

Company X operates a leading clothing brand in a developed country. The brand sells through their own stores as well as wholesale and online channels. Similar to most cases this brand also uses off-shore manufacturing in several developing countries.

Company X has volume based ranges (basic or core products) which run throughout the year and seasonal ranges which change quarterly (3 months). These seasonal ranges are developed by a dedicated design/product development team. Brand attains the differentiation in these ranges through innovativeness. This can be in colour, prints, shape, pattern, materials, product performance etc. Seasonal developments generally yield better margins. However, demand and margin variations from estimates are always high.

The key success factors for these ranges are reacting fast to fashion trend, colour themes, product innovativeness, product availability. Price is still key however above factors may help to exploit the demand at the peak and achieve better margins (with no discounts/mark downs etc.). Therefore, from a business point of view, increasing AGILITY (FAST RESPONSE) across the supply chain is key.

The next questions focus on areas where the brand can design the supply chain to be EFFECTIVE and EFFICIENT in managing the volume based ranges explained above.

Please rate the applicability of the following statements on a scale of 7 with 7 being Completely Agree, Completely Disagree for the focal product., considering the above context.

1 Reducing lead time of the product development/design process is important

As the word suggests, it's about designing the range as late as possible. This will help to yield better results. However, need to have a very strong product development back end.

Completely disagree Completely agree

1 2 3 4 5 6 7

2 Product Development

Material standardization in the product development phase is important *

This is to use standard materials as much as possible to achieve operational flexibility. For example, few similar fabrics/ same yarn for several fabrics, etc.

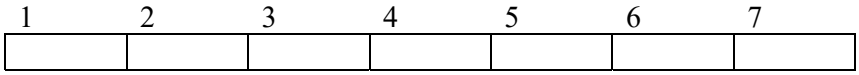
Completely disagree Completely agree

1 2 3 4 5 6 7

Style/shape standardization in the product design phase is important *

This is mostly about the shapes and pattern. It is using few key pattern blocks across the ranges where possible. E.g. - 3 key shapes for briefs/ 4 key shapes for bras / 3 key cup shapes, etc.

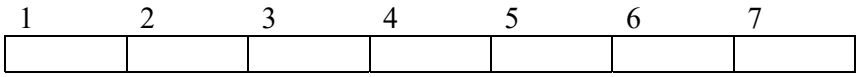
Completely disagree Completely agree



Postponement in product development is important *

This is another strategy used by some brands. Partial development happens with two or more vendors (may be with the cheapest and the fastest option / or in two regions where taxation is different) but select the final vendor very late when more information on market demand is available.

Completely disagree Completely agree

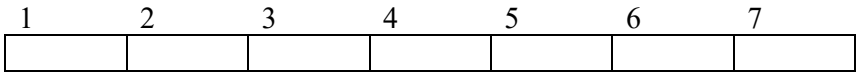


3 Manufacturing Operations

Manufacturing postponement is important *

This is another way of postponement. Customer share the forecasts in advance and then vendor can work with the suppliers and go ahead to arrange fabrics/trims for basic colours. Then the final manufacturing only happens after exact volumes are confirmed.

Completely disagree Completely agree



Vendor managed inventory is important *

Vendor has full access to the market demand data and vendor will manage production and the inventory for the buyer based on the information.

Completely disagree Completely agree

1	2	3	4	5	6	7

Vendor managed warehousing is important *

In vendor managed warehousing, vendor manages the warehousing and inventory on behalf of the brand.

Completely disagree Completely agree

1	2	3	4	5	6	7

Backward Integration is important *

This is a strategy where the brand moves to the previous (upstream) tier to own and control the backward operations.

Completely disagree Completely agree

1	2	3	4	5	6	7

Logistics Operations

Logistics Postponement is important *

This relates to having several warehouses located in different regions and decide which warehouse to use at the last moment depending on where the market demand is.

Completely disagree Completely agree

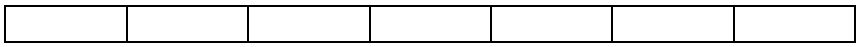
1	2	3	4	5	6	7

Warehousing options (cross docking/port splitting) is important *

These are logistic service features to reduce warehousing and internal transportation costs.

Completely disagree Completely agree

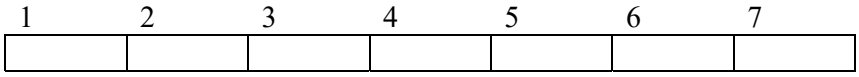
1 2 3 4 5 6 7



Logistics partnerships (3PL/4PL) is important *

3PL - Third party logistics providers: Completely separate organisations that provide logistics to manufacturers at a cost. 4PL - Fourth party logistics providers: Similar to 3PLs, but does not possess assets and operations as a high-level manager of logistics solutions.

Completely disagree Completely agree

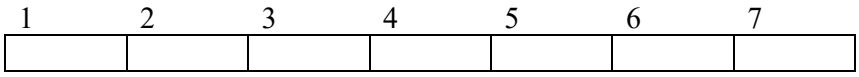


4 Sourcing/supplier Selection

Near shore manufacturing/sourcing is important *

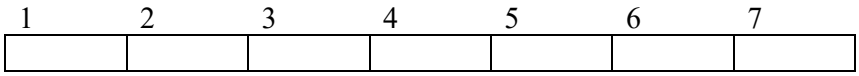
This refers to manufacturing or sourcing closer to the customers' demand nodes.

Completely disagree Completely agree



Working with FEW key strategic suppliers/vendors is important *

Completely disagree Completely agree



Connecting with ALL upstream partners (brand does all the product development and design for all the materials) in the supply chain is important *

Completely disagree Completely agree

1	2	3	4	5	6	7

Vendor is given the responsibility to manage the entire upstream supply chain is important *

Completely disagree Completely agree

1	2	3	4	5	6	7

Vendor is given the responsibility to manage selected parts of the supply chain only (non-strategic materials, e.g. generic trims) is important *

Completely disagree Completely agree

1	2	3	4	5	6	7

APPENDIX -2

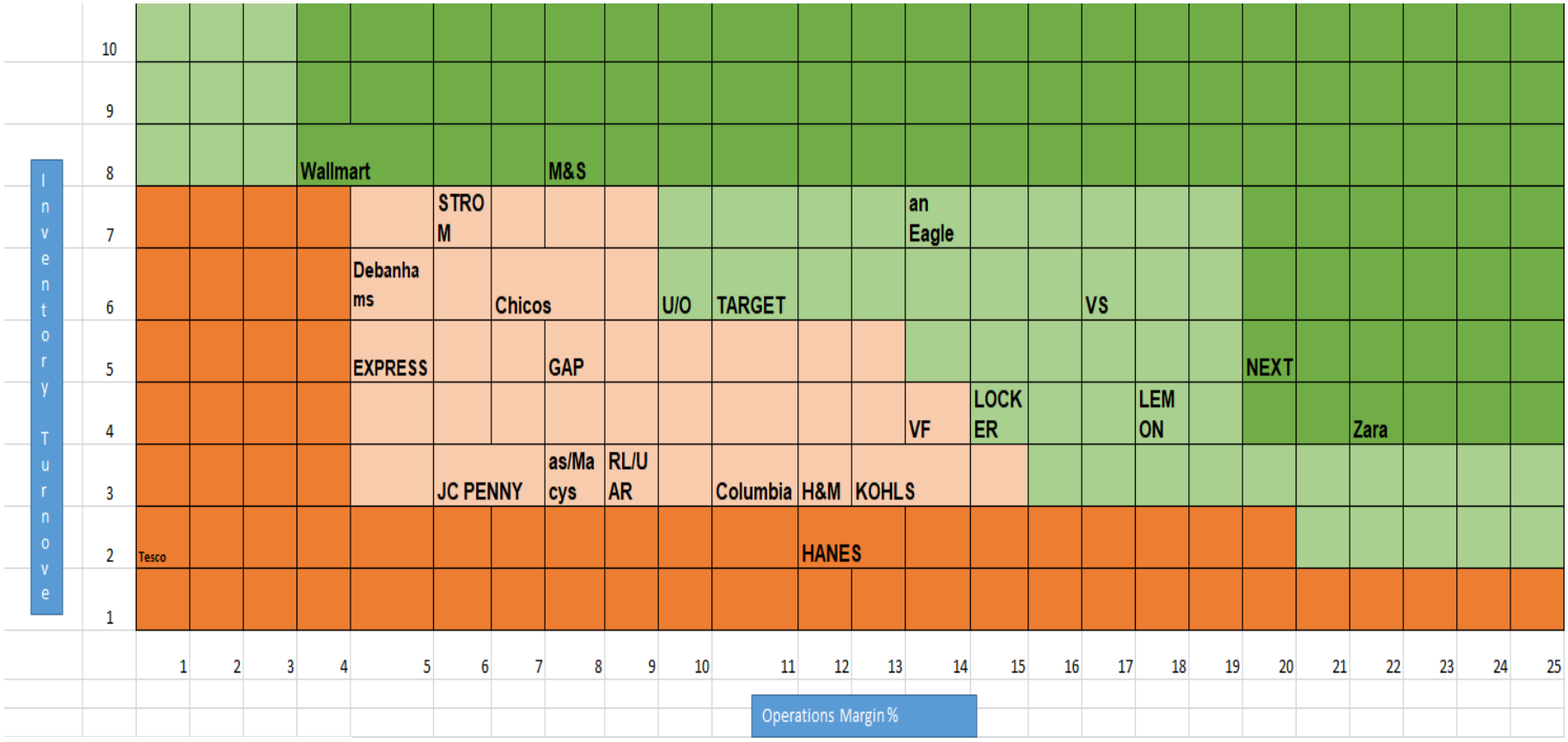
BRAND	*ADDIDAS*	*American Eagle*	*Chicos*	*Columbia*	*Debanhams*	*EXPRESS*	*FOOT LOCKER*	*GAP*	*H&M*	*HANES*	*JC PENNY*	*KOHLS*	*LULULEMON*	*M&S (Clothing)*	*MACYS*
OPERATING PROFIT%	8%	14%	7%	11%	5%	5%	15%	8%	12%	12%	6%	13%	18%	8%	8%
INVENTORY TURNOVER RATIO	3	7	6	3	6	5	4	5	3	2	3	3	4	8	3
MULTIFICATION	24%	100%	42%	32%	28%	24%	59%	40%	37%	25%	18%	38%	72%	60%	24%

Source: FY 2016 published financial records

BRAND	*NEXT*	*NIKE*	*NORDSTROM*	*PVH*	*RALPH LAUREN*	*Sears*	*TARGET*	*Tesco*	*UNDER ARMOUR*	*Urban outfitters*	*VF*	*VS*	*WALL MART*	*ZARA*	*REGINA*
OPERATING PROFIT%	20%	13%	6%	9%	9%	-6%	11%	1%	9%	10%	14%	17%	4%	22%	11.90%
INVENTORY TURNOVER RATIO	5	4	7	3	3	3	6	2	3	6	4	6	8	4	6
MULTIFICATION	100%	53%	43%	28%	26%	-19%	66%	1%	28%	57%	57%	101%	34%	88%	71.40%

Source: FY 2016 published financial records

APPENDIX -3



Source: Author