DYNAMICS OF GARMENT SUPPLY CHAIN

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ABSTRACT

The purpose of the study is to examine the supply chain structure of the garment industry in India. Indian garment industry is one of the leading garment industries in the world, which is full of diversities and complexities. The study aims at examining the existing structure of the supply chain at every level from raw material to the garment production until it reaches to the customer. The study also focuses on investigating the major supply chain challenges and aims at suggesting the proper supply chain framework. This is an exploratory research study which examines the structures and various issues concerned at every level of the supply chain. The study is based on the data available from the secondary sources as well as the review of literature from the available sources. The study finds that the Indian garment industry is facing many supply chain issues such as inventory management, visibility, lead time, collaboration, technology and logistics which are almost faced by all the companies all over the supply chain. The companies also vary in their size and are product offerings base on their target customer groups. Study also suggests the appropriate supply chain strategy for every combination of company type and product offered.

KEYWORDS

Garment Industry, Supply chain management, Quick response, Inventory management, Collaboration, product specific supply chain, India

1. INTRODUCTION

The textile and garment industry is one of the major industries in India having major contribution in GDP of the Economy. Indian textile and garment industry has its significance not only in the Indian market but it has its recognized presence and high stature in the global market also and it is one of the leading textile and garment industries in the world. The structure of the Indian textile and garment industry is full of variability having the players at every level of their supply chain with lot of structural, operational and performance differences. The industry consists of many organized entities which are highly structured, capital intensive and having most of the brand value in the market as well as the small scale, non-integrated spinning, weaving, finishing, and apparel-making enterprises and handicrafts dominated by the handlooms and power looms. Currently Indian textile Industry contributes about 14% to industrial production 4% to the country's GDP and 17% to country's export earnings. It provides employment to more than 35 million people in the country and is the second largest employment provider sector after agriculture. In the year 2010-11 total production of cloth was 59556 million square meters, out of which 2205 million square meters was produced by the mill sector.

Although, the Indian garment industry is among the top industries of the sector in the global market, its structure in the Indian conditions is full of diversities and it faces many infrastructural issues and differing structures of players involved at every level. These issues affect the supply chain of the companies which are already confronting the various supply chain and logistics related challenges. The basic supply chain challenges which the garment industry in India is facing are discussed later in the study. These are the challenges which are faced more or less by every company and contributing player in the industry here. Supply chain frameworks are needed to be designed as per the requirements of the particular companies in order to make them more efficient, responsive and competitive.

The study first discusses the structure of the garment industry in India, which further describes its challenges based on the study of the available literatures and suggests the suitable supply chain framework with the appropriate supply chain strategies according to the company structures and their product offerings. The study here explores many dimensions of the supply chain in the garment industry in India based on the review of the available literature which will be proved helpful and can be carried on for more descriptive study on the specific issues based on the real data in future.

2. STRUCTURE OF GARMENT SUPPLY CHAIN IN INDIA

The garment supply chain involves the major stages of fiber and yarn production, fabrication, garmenting, distribution and retailing (Sen, 2008; Varukolu and Poaps, 2009; Chaudhry and Hodge, 2012; Wilson, 2001; Fin, 2006). Supply chain structure of garment industry in India comes with lot of varieties of the players involved and their size and operational differences at every stage in the chain. The differences are not only based on the operational and structural variability at different stages i.e. difference among the members of two stages, but it also exists among the various counterparts competing at the same stages. Although, the stage wise difference among the players and their operations is obvious and needs the thorough consideration of the supply chain practitioners, as the chain accounts for a value addition of 300% – 400% from raw material stage to the finished garment (Verma, 2000). However, there are many small and large players at every stage of the supply chain claiming their association with either the organized or the unorganized sector (National Productivity Council, 2010; EXIM Bank, 2008), having their involvement in many supply chains at the same time which again consists of high variability among the members. The whole process together creates the complexity, which necessitates the separate study of every stage in order to understand the structure and dynamics of the complete supply chain in the Indian garment Industry.

2.1 Stage I: Fiber Production

The first and basic stage in the garment supply chain is fiber production. Fiber is the primary material which is necessary to make any kind of garment product. Fibers can be classified in two types: natural and manmade or synthetic fibers. Natural fibers are either referred to the plant fibers which are produced in the farms such as cotton, linen, jute and bamboo, etc. (Sen and Reddy, 2011; Tanchis, 2008), or the animal fibers such as wool, fur and silk etc. (Beckwith, 2008; Sen, 2008; Wilson, 2001). Natural fibers are produced by the agricultural firms.

Manmade fibers also termed as the synthetic fibers or artificial fibers are generally produced from coal, petroleum and castor oil (Tanchis, 2008) which include polyester, nylon, acrylic, Rayon and

Acetate etc. (Tanchis, 2008; Wilson, 2001; Sen, 2008). Another variety of fibers are blended fibers which are the blend of both natural and synthetic fibers (Tanchis, 2008). In 2011-12 production of the manmade fibers in India is 1233.61 million kg. (India Stat).

2.2 Stage II: Yarning/Spinning

The next stage in garment supply chain consists of converting the natural and manmade fibers into yarns. Here fiber is spun in the spinning mills where in the mechanical process they are kept in the lengthwise direction and twisted together in order to convert into the yarns either single or folded (Wilson, 2001). Yarns are produced in regular and fancy varieties.

2.3 Stage III: Fabric Production

Fabric production the major stage of the garment supply chain mainly consists of weaving and knitting process as well as the non woven process, where the woven fabrics are produced by interlacing two threads in lengthways and widthwise directions. The knitting process involves the interlacing the loops of yarns which are formed either mechanically or manually by the pair of knitting needles. The non woven process consists of looping, fixing, knotting, plaiting or twisting the yarn in the way other than weaving and knitting, in order to produce the fabric. The Indian garment industry has variety of players involved in fabric production; however, the sector is mainly divided into two parts: The organized sector including the large scale and techno savvy composite mills; while on the other hand there is the unorganized sector which consists of the small weavers and knitters including the handlooms mainly based on the household business, powerlooms and knitting machines (Chandra, 2006). After producing the fabric, it's processing of the dyeing, printing and finishing (EXIM Bank, 2008).

2.4 Stage IV: Garment Production

Garmenting (Dveraja, 2011; Gereffi and Memedovic, 2003) process consists of various stages including: Designing (Dveraja, 2011; Sen, 2008; EXIM Bank, 2008), where various designs and their different variants based on the market trends, customer needs and demand forecasting are created. Companies either have their own designers or outsource from the various designer houses.

Once the designs are selected, pieces of the fabric are cut in the specific shapes and sizes for the different variants of the specific designs. The pieces are then joined together in the predefined manner as per the requirements of the design, through the stitching process. Many Indian garment manufacturing companies do this process of cutting and stitching process themselves, whereas others source the local contract manufacturers for both the processes of cutting and stitching and provide them the designs and instructions for every step. However, some of the companies perform the cutting in-house and hire local contract manufacturers for stitching the joints in a prescribed manner.

Once the garment is stitched and prepared it is sent back in case the stitching process was outsourced, and the garment products are prepared for the finishing process where it is cleaned, pressed and final preparations are done. The postponed activities decoupled in the previous processes and not finished till then, if any, are also finished at this stage. After finishing it is

packed, labeled and distributed to their respective retail stores through the appropriate logistics system and network.

2.5 Stage V: Retailing

The structure of retailing sector in the Indian garment industry includes the variety of retailing formats (Sinha, 2004; Bharathi, 2010; Sharma, 2012; Jun *et al.,* 2004; Sen, 2008), with structural varieties, distinguished approaches and operational differences. In Indian market there are specialty retailers dealing in specialized clothing and related merchandise from a single company and generally owned or franchised by the garment company, such as wills life style, Koutons, Zara, etc. There are the department stores, which are the large retailers having wide and deep range of assortments of garment products and their variants, usually divided into departments based on product, service and control wise differentiations, such as: Shoppers Stop, Globus and Westside (Sharma, 2012; Bharathi, 2010). Another type of retail stores are Full Line discount stores (Sinha, 2004) such as Big Bazaar and Vishal Mega Mart who offer the medium to low range branded products and assortments and use the value based pricing strategy which attracts the middle and lower middle class of the Indian customers who form the majority of the population of country and hence increasing the customer turnover in the stores.

Off – price stores also exist in the Indian garment retail market offering the branded and designer products at very low and discounted prices (Sinha, 2004; Sen, 2008), however, they lack in assortments and usually sell the off season products and the items garment companies are dumping due to overstocking. There are the factory outlets which offer the products at much discounted rates. Another format which has brought revolution in the garment retailing is through internet also termed as e-tailing where the online retailers differing in their wide range of merchandise assortments, promotion strategies and customer service levels (Jang and Burns, 2004) sell their products to the customers on a computer screen with a facility of home delivery. In Indian Market Myntra, Jabong, Bag it today and Naaptol are the popular e-tailers dealing in variety of branded, value based and non-branded garment products.

In the supply chain of garment industry coordination between the flow of information and the flow of product and material is very important. The flow of material and product takes place in the forward way which is based on the flow of information about the customer orders, demands and market needs and trends heading backward from customers to the retailers and through them to manufacturers who pass on the information regarding the raw material needs to the suppliers. Synchronization between the information flow and material flow is very important and the companies having higher synchronization between the two are performing better in the industry in India.

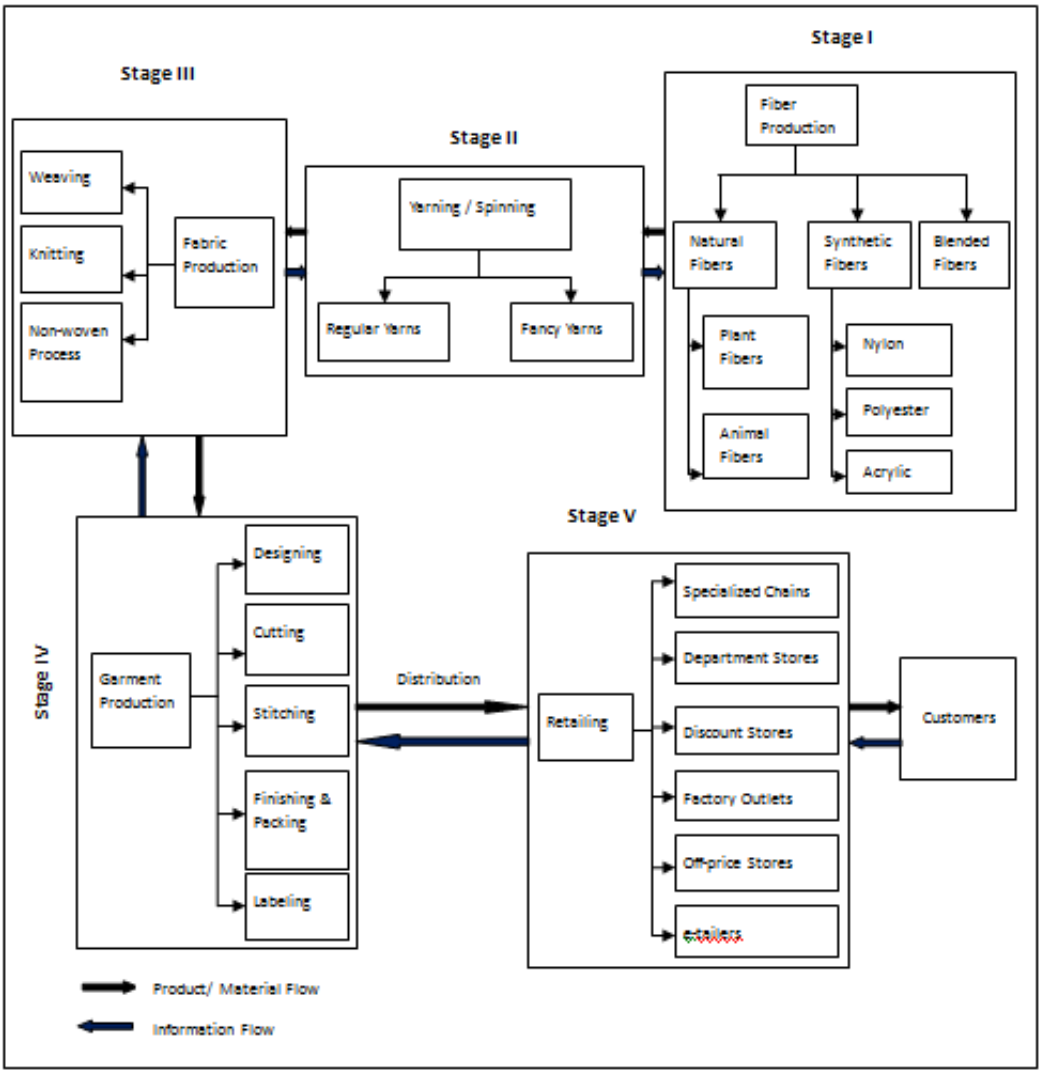

Figure 1: Garment supply chain structure in India

3. SUPPLY CHAIN ISSUES IN INDIAN GARMENT INDUSTRY

Supply chain in Indian scenario (Jayaram and Avittathur, 2012; Sahay and Mohan, 2003; Sahay, *et al.*, 2003) including the garment industry is full of complexities and unlike the European countries and other parts of the developed world, a lot of work is needed to be done in India in terms of the supply chain management practices. Although a lot of economic and industrial reforms (Bhandari and Maiti, 2007) have been made in the garment industry in India and it has an improving trend in the economic and productivity terms (Joshi and Singh, 2010); but when it is about supply chain of Indian garment companies it is full of challenges and issues needed to be resolved in order to gain the competitiveness (Sahay *et al.,* 2006) globally. Indian companies are facing the wide issues of inventory management (Sahay and Mohan, 2003), visibility, wastes, responsiveness, Longer lead times (Dabas and Sternquist, 2012; Sahay and Mohan, 2003), Collaboration (Anbanandam *et al.,* 2011; Borade and Bansod, 2010; Dabas and Sternquist, 2012),

technology (Dabas and Sternquist, 2012; Varukolu and Park-Poaps, 2009; Office of Industries, U.S. International Trade Commission, 2001) and logistics and transportation problems (Jayaram and Avittathur, 2012; Sahay and Mohan, 2003).

3.1 Inventory Management

Managing inventory is a major issue garment industry is facing in India. Garment products are highly volatile in nature and have the shorter life cycles especially in the case of innovative and fashion products (Patil et al., 2010; Richardson, 1996). Their demand changes very fast as customer preference and market trends are highly variable in nature. Therefore, it requires the inventory level to be optimum (Walters, 2003; Muckstadt and Sapra, 2010) i.e. neither too much nor too less. Excess of inventory causes overstocks, obsolescence and blocks the space for demanded products. Overstocks are then required to be dumped in sale resulting in markdowns; whereas, low inventory results causes out of stocks and results in lost sales (Fisher *et al.* 2000). Companies in India are facing a major problem related to the inventory management (Sahay and Mohan, 2003) which must be considered, especially in garment industry with unpredictable nature. Garment Companies in India usually confront with the challenges of overstocking of particular varieties of assortments, gradually heading towards obsolescence as well blocking the way of demanded products. Many of these companies including very renowned players have significantly very high level of inventory in their stores. Indian garment company 'Koutons' holds the inventory level of eight months of sales claiming the highest level of inventory in the industry in India, while, the companies like 'Pantaloon' keeps the inventory of three months (Jayaram and Avittathur, 2012), 'Shoppers stop' two months and 'Trent' holds an inventory of two months of sales (Singh, 2010).

3.2 Lead Time

Garment industry confronts a major issue of very high lead time despite of its short life cycle and volatile demand (Choi and Sethi, 2010). Buying cycle for the garment products start generally in a year advance and the garment companies place and process their manufacturing orders for the garment products from 6 months to one year ahead of the coming seasons when the product is actually required and will be available in the stores for the sales (Al-Zubaidi and Tyler, 2004; Birtwistle *et al.* 2006). Higher lead time reduces the responsiveness and increases the chances of high inventory holding and therefore, problem of overstocking. Placing the order in a year advance based on the forecasting of the demand of the coming whole season or year, while the market trends and customer demands may considerably vary is an important issue the garment industry in India needs to tackle.

3.3 Visibility

Visibility (Bartlett, 2007) is very important in supply chain in order to improve transparency (Lamming et al. 2001; Svensson, 2004) through the delivery of fast and accurate information (Chan, 2003; Lamming et al. 2001). Lack of accurate information results in wrong estimates of the inventory at the various stages of the supply chain resulting in variation among exact requirements, orders placed and delivered inventory, which is known as bullwhip effect (Lee *et al.* 1997). Lack of visibility reduces the real time traceability of the inventory which results in the very common problems of obsolescence of the inventory, overstocks of the existing inventory in the stores and stock outs of the running inventory which is in demand.

Indian garment companies are confronting the visibility problem at every level of their supply chains, which is the basic reason of lack of coordination and high inventory levels the industry is facing. Because of the low visibility in the supply chain garment companies face the problem of delayed reaction time and low responsiveness to the customer and market demand which is made worse by the longer lead times.

3.4 Collaboration

Collaboration in supply chain refers to the information sharing (Dabas and Sternquist, 2012), joint decision making and benefit sharing between two or more supply chain members in order to improve profitability and satisfy the customer needs (Simatupang and Sridharan, 2002). A successful collaborative practice requires the coordination among the various supply chain members (Cao *et al.* 2008) as well as in the inter-industrial partnerships i.e. co-marketing alliances (Ahn *et al.* 2010). The major identified variables affecting the supply chain collaboration in garment sector in India are; top management commitment, information sharing, trust among the supply chain partners, long term relationships and risk and reward sharing (Anbanandam *et al.* 2011).

Companies in India are aware of the concepts of partnership and collaboration, but have their doubts over its successful implementation (Altekar, 2004) and hence, generally fail to form a long term collaborative relationship. Major areas where supplier's involvement is initiated in the Indian companies are quality improvement, JIT implementation, supply planning and transactional performance mainly at the level of finished production (Altekar, 2004). Indian companies give priority to transactional convenience, material planning and resource optimization; over common R&D strategy, central auditing, performance sharing and common business orientation while forming a collaborative relationship (Altekar, 2004). However the companies in India including the ones in textile industry the major supply chain challenges like lack of transparent relationship between the supply chain members who generally avoid to share the real time information as well as the risks and rewards (Zahedirad and Shivaraj, 2011). Along with the inadequate information system the supply chains they also suffer with the lack of top management's support as a major barrier in forming the collaborative relationship (Zahedirad and Shivaraj, 2011).

3.5 Logistical Challenges

India has large network of roads, rail, ports, inland waterways and air transport. Total length of road length is 46.90 lakh kilometers in 2011 which includes 70,934 kilometers of national highways and 163,898 kilometers of state highways (Ministry of Road Transport & Highways, 2012). As per the data, in 2010 – 11 the total length of railway tracks in India is 114037 kilometers and the total length of running tracks is 87114 kilometers (India stat). There are 12 major ports in India with a cargo handling capacity of 670.13 million tonnes in 2010 – 11, which handled 569.91 million tonnes of cargo in the year 2010 – 11 (India stat). India has 15,544 kilometer of navigable waterways consisting of the rivers, canals, backwaters etc. out of which about 5200 kilometers of rivers and 485 kilometers of canals are suitable for mechanized transportation (Planning Commission, 2012). The total freight movement at the top 46 airports in India including international, JV international, custom and domestic airports in the year 2011 – 12 is 2279987 tones.

An efficient logistics system is required for an effective supply chain (Sharma *et al.,* 2013). In spite of the large and impressive logistical network and figures there are inefficiencies in the Indian logistics setup (KPMG, 2010). Logistical infrastructure in India is highly fragmented and includes both the organized and unorganized companies, which is mainly dominated by the unorganized sector consisting of the brokers and transport companies affiliating the small owners having five or less trucks, small warehouse operators, customs brokers, etc. (Planning Commission, 2012). High fragmentation and underdevelopment of Indian logistics Industry results in the lack of economies of scale (Planning Commission, 2012). The underdeveloped and poor physical and communication infrastructure is the main reason why Indian logistics industry is underperforming (Planning Commission, 2012). Bad conditions of the roads and many check posts with different document requirements slow the movement of the cargo (Planning Commission, 2012; Jayaram and Avittathur, 2012) and it takes three times more time reaching its destination than the one in USA (Jayaram and Avittathur, 2012). Insufficient infrastructure of seaports and the procedural clearances lead to the congestion which results into the long waiting time of the ships at the ports which may be as long as 5 days (Planning Commission, 2012; Jayaram and Avittathur, 2012).

3.6 Technology

From the technological perspective the Indian companies need more development who are not as advanced as their American or European counterparts. Companies including the ones in the garment sector have insufficient technological and information system framework (Jayaram and Avittathur, 2012), including the real time and point of sale information among the supply chain members. They are lacking in technological advancement and far behind in the implementation of the practices like VMI and CPFR (Jayaram and Avittathur, 2012) and in spite of its proven necessity Indian companies are spending very less on their IT budget (Sahay and Mohan, 2003).
The technologies which garment companies in India mainly use are computer aide designs (CAD), high speed sewing machines and modern fussing and pressing machines including the wide use of internet; whereas, use of robots and automation in processes such as inspection and material handling is very low (Varukolu and Park-Poaps, 2009). Indian garment companies are also lacking in the sufficient use of RFID technology in their supply chain in order to enable the real time traceability of the garment products throughout the chain.

4. SUGGESTED SUPPLY CHAIN FRAMEWORK

As discussed earlier garment companies in India face lots of supply chain related challenges which affects their responsiveness capabilities and their global competitiveness. A proper strategic supply chain framework is required in order to cope up with the changing market situations, customer demands and overcoming the various challenges. While making the strategic supply chain framework for the garment companies in India the first question which arises in front of the supply chain thinkers is the correct supply chain models which suit the different product offerings in different markets.

The product strategy of the garment company should match with its supply chain strategy (Fisher, 1997; Chopra and Meindl, 2007). Customer orientation (Khan, 2013) and value creation (Riemann, 2013; Sultan and Saurabh, 2013) in the supply chain stages is a crucial phase for any supply chain. A supply chain strategy matching with the product type will bring the efficiency while a supply chain which does not match with the product type may be disastrous for the

company. It will create the problems causing the blockages in the supply chain. Only solution is to identify the problem as soon as possible and restructure the supply chain as soon as possible. Sooner the problem will be identified less will be damages and the system may be restored more easily, whereas, the delays in identifying the problems will create more delays in restoring (Sterman, 2000). A supply chain must match its product type (Fisher, 1997) and if not then it should be redesigned soonest possible.

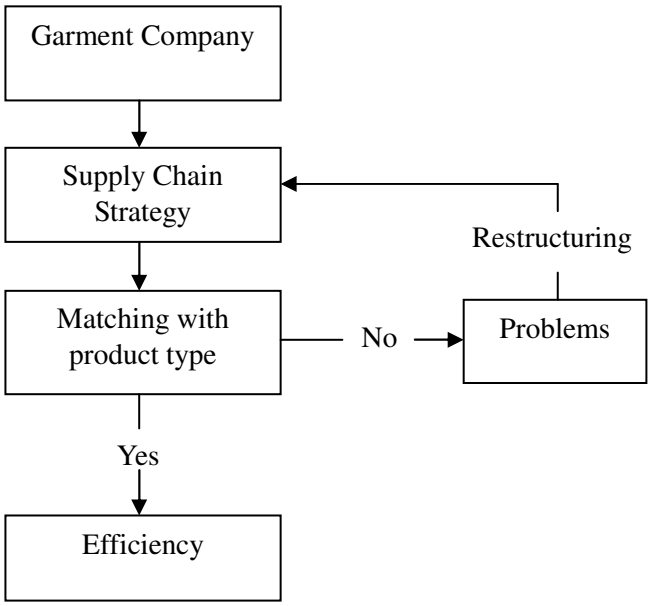

Figure 2: Strategic Supply Chain Framework

4.1 Strategic Fit

The products offered in the Indian garment market may be divided into two categories i.e. customized and standardized. However, it is very rare to find a garment product which is either only customized or standardized, but there is the blend of the customization and standardization where they vary from a low degree of customization to the high degree of customization and in the same way from high standardization to the low standardization. To best describe it can be divided into following types of situations:

(1) High customization
(2) Moderate customization and standardization
(3) High standardization

The supply chain strategy according to the nature of the product is very essential as described by Fisher, 1997; Christopher and Towill, (2002) and Naylor et al. (1999). Fisher, 1997 describes two kinds of products; innovative which has high variability in demand and earns high profit margin as well, needs a responsive supply chain which also termed as agile supply chain by Christopher and Towill, (2002) who suggest it for the fashion products, products with high volatility in demand, high product variety, short product life cycles and high profit margins. These products are highly customized to the market trends, fashion needs and customer demands. The second type of the product described by Fisher, 1997 is functional products having predictable and stable

demand which doesn't vary too much over the period of a time and having the long life cycles for which he suggest the efficient supply chain named as lean supply chain by Christopher and Towill, (2002); focused on reducing the wastes and lowering the supply chain costs. These products are highly standardized in nature. However, Naylor et al. (1999) describe about leagility which is combination of both the lean and agile supply chains. A proper strategic fit between the type of product and the kind of supply chain is also very essential (Chopra and Meindl, 2007).

In the situation of high customization where the products are designed to the customer demands and fashion trends, it requires the supply chain to be agile. The situation of high customization brings forth the high volatility and high uncertainty as it is focused on particular customers and a particular trend and thus needs to be responded quickly. On the other hand high standardization which has static demand over the period of time and low profit margin as well requires a lean supply chain. While a product type which lies in between these two sides needs to have a leagile supply chain. However the degree of customization and standardization varies from product to product, therefore, it requires a strategic fit between the supply chain strategy and the product type as shown in figure 3 which is influenced by the Model of Strategic fit by Chopra and Meindl (2007). Degree of variation in the supply chain strategy should be equal to the degree of variation in the product type. Lower the difference between these two variations higher will be the strategic fit and *vice versa*. In order to be efficient enough the garment companies should put their strategic framework as near to the zone of strategic fit as possible.

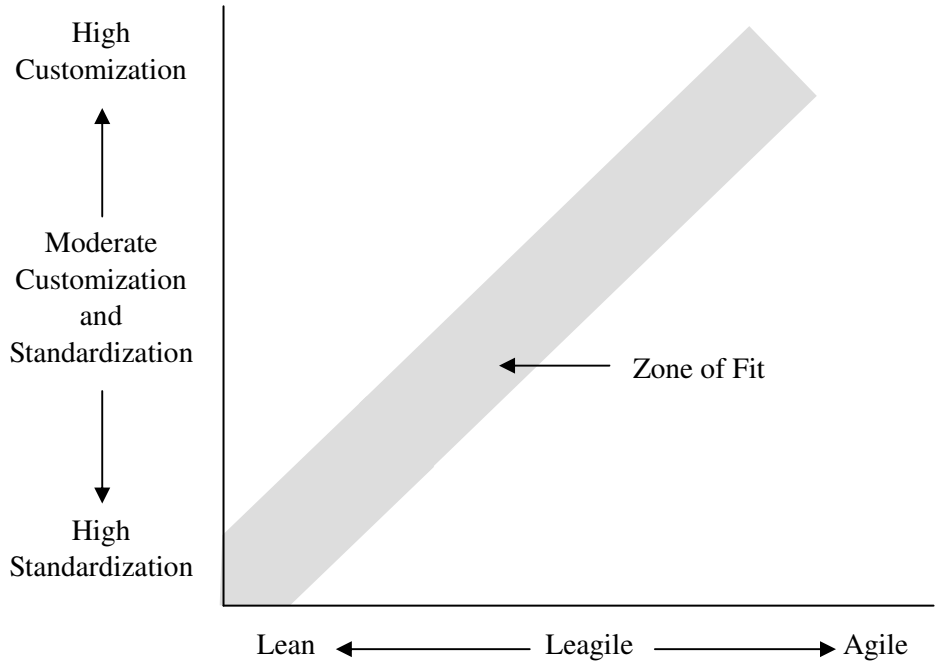

Figure 3: Strategic Fit

4.2 Improvements required in the existing supply chain structure

The current supply chain structure of garment companies in India faces lot of challenges as discussed earlier, which is mainly based on inventory management, lead time, collaboration, technology and logistics. A right supply chain for the right garment product will be helpful in maintaining the proper inventory flow and maintaining the optimum lead time as required by the corresponding supply chain, which will be helpful in overcoming the situations of overstocking or the stock outs and the lost sales (Fisher *et al.* 2000). One more practice which is widely practiced in European and American garment companies but is still about to find its way in Indian context is Quick Response (QR) (Christopher *et al.* 2004); will be proved revolutionary for the Indian companies and will solve many problems. QR focuses on the importance of POS data in order to make the supply chain demand driven and uses the practices such as CPFR and VMI (Choi and Sethi, 2010), which improves the collaborative practices among the supply chain partners, as well as maintains the flow of inventory while keeping the inventory level to the minimal and reducing the lead time.

Using RFID technology widely will also be helpful for the Indian garment companies in order to maintain the real time tracing and visibility of the garment products, which is also termed as essential in QR by Choi and Sethi, 2010. RFID is effective everywhere in supply chain which detects errors in manufacturing, in warehousing starting from reception area to the storage area through cross docking till the outgoing area, and at the sales floor. It makes the real time visibility of the products at all the above stages as well.

5. CONCLUSION

Garment industry in India is full of variations consisting of many small and large players at every level of the supply chain. They differ in terms of their operations, their target customers and their supply chain structures. However, supply chain in India is full of many complexities, issues and facing many challenges which is mainly related to inventory management, lead time, collaboration, technology and logistics and transportation. Although, these are the major issues where each one is needed be resolved in order to be efficient, responsive and competitive in the market; These issues will be resolved if the garment companies adopt the appropriate supply chain strategy according to their size, operational needs and customer focus. The supply chain strategy needs to be according to type of the offerings and the target customer group. Companies need to work on the zone of strategic fit between their product strategy and their supply chain strategy.

Implementation of the QR practices, CPFR, VMI and use of RFID technology and other Information technology techniques will resolve many issues such as traceability of products and errors, visibility, the real time customer demand analysis, collaboration and the scope of use of POS data will be increased.

However, the study leaves the scope for the further research on these issues separately in a detailed way. It also allows the future researches based on the real time data from the garment companies and assessment of their supply chain structures.

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