

INTRODUCTION

1.1. History of Indian textile industry

The history of textiles in India dates back to nearly five thousand years to the days of the Harappa civilization. Evidences that India has been trading silk in return for spices from the 2nd century have been found. This shows that textiles are an industry which has existed for centuries in our country. Recently there has been a sizeable increase in the demand for Indian textiles in the market. India is fast emerging as a competitor to China

In Textile exports The Government of India has also realized this fact and lowered the customs duty and reduced the restrictions on the imported textile machinery. The intention of the government's move is to enable the Indian producers to compete in the world market with high quality products. The results of the government's move can be visible as Indian companies like Arvind Mills, Mafatlal, Grasim; Reliance Industries have become prominent players in the world. The Indian textile industry is the second largest in the world-second only to China. The other competing countries are Korea and Taiwan. Indian Textile constitutes 35% of the total exports of our country.

During the 13th century, Indian silk was used as barter for spices from the western countries. Towards the end of the 17th century, the British East India Company had begun exports of Indian silks and several other cotton fabrics to other economies. These included the famous fine Muslin cloth of Bengal, Orissa and Bihar. Painted and printed cottons or chintz was widely practiced between India, Java, China and the Philippines, long before the arrival of the Europeans.

India Textile Industry is one of the largest textile industries in the world. Today, Indian economy is largely dependent on textile manufacturing and exports. India earns around 27% of the foreign exchange from exports of textiles. Further, India Textile Industry contributes about 14% of the total industrial production of India. Furthermore, its contribution to the gross domestic product of India is around 5% and the numbers are steadily increasing. India Textile Industry involves around 45 million workers directly and it accounts for 21% of the total employment generated in the economy.

Strengths of Indian Textile Industry are as follows -

1. Huge textile production capacity
2. Efficient multi-fiber raw material manufacturing capacity
3. Large pool of skilled and cheap work force
4. Entrepreneurial skills
5. Huge export potential
6. Large domestic market
7. Very low import content
8. Flexible textile manufacturing systems

Weaknesses of Indian Textile Industry are as follows -

1. Increased global competition in the post 2005 trade regime under WTO
2. Imports of cheap textiles from other Asian neighbors
3. Use of outdated manufacturing technology
4. Poor supply chain management
5. Huge unorganized and decentralized sector
6. High production cost with respect to other Asian competitor

1.2. Global scenario

The textile and clothing trade is governed by the Multi-Fiber Agreement (MFA) which came into force on January 1, 1974 replacing short-term and long-term arrangements of the 1960's which protected US textile producers from booming Japanese textiles exports. Later, it was extended to other developing countries like India, Korea, Hong Kong, etc. which had acquired a comparative advantage in textiles. Currently, India has bilateral arrangements under MFA with USA, Canada, Australia, countries of the European Commission, etc. Under MFA, foreign trade is subject to relatively high tariffs and export quotas restricting India's penetration into these markets. India was interested in the early phasing out of these quotas in the Uruguay Round of Negotiations but this did not happen due to the reluctance of the developed countries like the US and EC to open up their textile markets to Third World imports because of high labor costs. With the removal of quotas, exports of textiles have now to cope with new challenges in the form of growing non-tariff / non-trade barriers such as growing regionalization of trade between blocks of nations, child labor, anti-dumping duties, etc.

Nevertheless, it must be realized that the picture is not all rosy. It is now being admitted universally and even officially that the year 2005 AD is likely to present more of a challenge than opportunity. If the industry does not pay attention to the very vital needs of modernization, quality control, technology up gradation, etc. it is likely to be left behind. Already, its comparative advantage of cheap labor is being nullified by the use of outmoded machinery.

With the dismantling of the MFA, it becomes imperative for the textile industry to take on competitors like China, Pakistan, etc., which enjoy lower labor costs. In fact the seriousness of the situation becomes even more apparent when it is realized that the non-quota exports have not really risen dramatically over the past few years. The continued dominance of yarn in exports of cotton, synthetics, and blends, is another cause for worry while exports of fabrics are not growing. The lack of value added products in textile exports do not augur well for India in a non-MFA world.

1.3. Indian textile industry

The textile industry is the largest industry of modern India. It accounts for over 20 percent of industrial production and is closely linked with the agricultural and rural economy. It is the single largest employer in the industrial sector employing about 45 million people. If the employment in allied sectors like ginning, agriculture, pressing, cotton trade, jute, etc. are added then the total employment is estimated at 93 million. The net foreign exchange earnings in this sector are one of the highest and, together with carpet and handicrafts, account for over 37 percent of total export earnings at over US \$ 10 billion. Textiles, alone, account for about 25 percent of India's total forex earnings.

India's textile industry since its beginning continues to be predominantly cotton based with about 65 percent of fabric consumption in the country being accounted for by cotton. The industry is highly localized in Ahmadabad and Bombay in the western part of the country though other centers exist including Kanpur, Calcutta, Indore, Coimbatore, and Sholapur.

The structure of the textile industry is extremely complex with the modern, sophisticated and highly mechanized mill sector on the one hand and the hand spinning and hand weaving (handloom) sector on the other. Between the two falls the small-scale power loom sector. The latter two are together known as the decentralized sector. Over the years, the government has granted a whole range of concessions to the non-mill sector as a result of which the share of the decentralized sector has increased considerably in the total

production. Of the two sub-sectors of the decentralized sector, the power loom sector has shown the faster rate of growth. In the production of fabrics the decentralized sector accounts for roughly 94 percent while the mill sector has a share of only 6 percent.

Being an agro-based industry the production of raw material varies from year to year depending on weather and rainfall conditions. Accordingly the price fluctuates too.

The Ministry of Textiles under the Government of India has taken some significant steps to arrest these problems. It has framed "The National Textile Policy 2000" to address the aforesaid issues. This policy aims at negating these problems and increasing the foreign exchange earnings to the tune of US\$ 50 billion by the year 2010. It includes rational road-maps for the development and promotion of all the sectors involved directly or indirectly with the textile industry of India. Further, the policy also envisages to bring the unorganized decentralized textile sector (which accounts for 76% of textile production) at par with the organized mill sector. Furthermore, the policy also aims at introducing modern and efficient manufacturing machineries and techniques in the Indian textile sector

1.3.1. Current Industry Scenario

Close to 14% of the industrial output and 30% of the export market share is contributed directly by the Indian textile industry. Indian textile industry is also the largest industry when it comes to employment that generates jobs not just within but also in various support industries like agriculture. As per a recent survey the textile industry is going to contribute 12 million new jobs in India by 2010 itself.

Indian textile industry is as old as the word textile itself. This industry holds a significant position in India by providing the most basic need of Indians. Starting from the procurement of raw materials to the final production stage of the actual textile, the Indian textile industry works on an independent basis.

The final phase-out of the Multi-fiber Arrangement (MFA) and the system of quotas that has governed the global trade in textiles and apparel for the last forty-two years has significantly altered the institutional rules of trade in the textile and clothing industry. With the elimination of all remaining quotas on apparel from January 1 2005, the textile and clothing sector is now fully integrated into the regulatory framework of the General Agreement on Tariffs and Trade (GATT) of the World Trade Organization (WTO). Buyers are now free to source textile and apparel in any amount from any country; suppliers are similarly free to export as much product as they are able, subject only to a system of

national tariffs. As global competition intensifies under the new quota-free trading regime, countries are bracing for major changes in the structure of sourcing and apparel supply worldwide. With the removal of the quotas, it was expected that the developing countries, which have a major play in the textile industry will benefit themselves as they have stable supply network, experience in networking, capacities for scaling up and the ability to offer a full bundle of services. It was also expected that smaller countries, which enjoyed the restriction on trade will fall out from the picture. The textile sector has increased their investment in projects to upgrade their equipment amid fierce market competition and to meet the growing demand for more textile products. Total investment in the textile industry between 2004 and 2008 was around Rs.65,478 Cr in India, which is expected to reach Rs.1,50,600 Cr. by 2020. This enhanced investment would generate 17.37 million jobs-- 12.02 million direct and 5.35 million indirect—by 2020. Investments in the textiles sector can be accessed on the basis of three factors:

1. Plan schemes such as the Techno Up-gradation Funds Scheme (TUFS), Technology Mission on Cotton, Apparel Parks, etc. Under the TUFS scheme, a total of Rs 916 billion has been disbursed for technology up gradation. There are around 26 Apparel Parks in eight states in India, with a total estimated investment of Rs 134 billion
2. Industrial Entrepreneurship Memorandums implemented from 1992 to Aug 06, amounting to Rs 263 billion
3. Foreign Direct Investments inflows worth US\$ 910 million have been received by the textile industry between Aug 91 and May 06, which account for 1.29% of total FDI inflows in the country.

Though significant investments are being made in the textiles segment, the bulk of them are in the spinning and weaving segments. A cumulative total of US\$ 6.67 billion in investment was done in 2008. Of this, more than two-thirds is in the spinning and weaving segments, while only 25% is in processing and garment units.

The global fiber industry will continue to shift to the Asia/Pacific region, particularly China, South Korea and Taiwan. Textile trade in the world is estimated to be around US\$ 300 billion currently. Industry experts predict that by 2014 the facilities in the west will close down and they will source their textiles from more efficient areas of the world resulting in the trade volume of around US\$ 800 billion. The Indian textile industry, which has accelerated to an annual growth of 9-10 per cent, is expected to grow at a rate of 16 per

cent in value terms and reach a level of USD 115 billion by 2012. With 8.6% growth rate, Pakistan exports amounted to 9.9 billion US-Dollars in 2005 which translates into an average annual growth rate of 5.4%. As of now, the general impression any individual would get about the Indian textile industry leaders in the past few months is that it is in a major decline state. The following could be the reasons that attribute to this decline.

1. Global recession
2. Less export orders due to reductions in inventories by global retail giants like Wal-Mart
3. Rising price of raw materials like cottons
4. Infrastructure bottlenecks such as power, particularly in Tamil Nadu

In the times of adversity, like what we are facing right now, it is an immediate task for all stake holders to pause for a moment and take stock of the difficulties and chart plans for sustainability and growth of the Indian textile industry.

The weak links in the Indian conventional industry such as weaving and finishing have to be strengthened. There must be consolidated efforts by Indian Textile Machinery Manufacturers Association, end-users and the Government to undertake a major step and come-up with alternatives to European Machinery, which the Indian weaving sector can afford. This should be put into practice within the next five years, if dedicated efforts are undertaken with the financial support for R & D by the Government through its various schemes. Technical textiles sector must transform from a non-crawling phase to at least a crawling industry in the next three years.

1.4. Contribution to economy

1. India covers 61 percent of the international textile market India covers 22 percent of the global market
2. India is known to be the third largest manufacturer of cotton across the globe
3. India claims to be the second largest manufacturer as well as provider of cotton yarn and textiles in the world
4. India holds around 25 percent share in the cotton yarn industry across the globe
5. India contributes to around 12 percent of the world's production of cotton yarn and textiles

1.5. Focus of study

The focus of the study is to examine the supply chain structure of the industry in India.
Indian

Textile industry is one of the leading textile 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 apparel 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 interview of experts from the available sources. The study finds that the Indian textile 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.

STRUCTURE OF TEXTILE INDUSTRY IN INDIA

The textile supply chain involves the major stages of fiber and yarn production, fabrication, garmenting, distribution and retailing. Supply chain structure of textile industry in India comes with lot of varieties & 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. 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, 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. or the animal fibers such as wool, fur and silk etc. 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 which include polyester, nylon, acrylic, Rayon Another variety of fibers are blended fibers which are the blend of both natural and synthetic fibers. Production of the manmade fibers in India is 1433.61 million kg.

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. 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 nonwoven process, where the woven fabrics are produced by interlacing two threads in lengthways and width wise 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 nonwoven 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, power looms and knitting machines. After producing the fabric, it's processing of the dyeing, printing and finishing.

2.4. Stage IV: Garment Production

Garmenting process consists of various stages including: Designing 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 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 Another type of retail stores are Full Line discount stores 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 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 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.

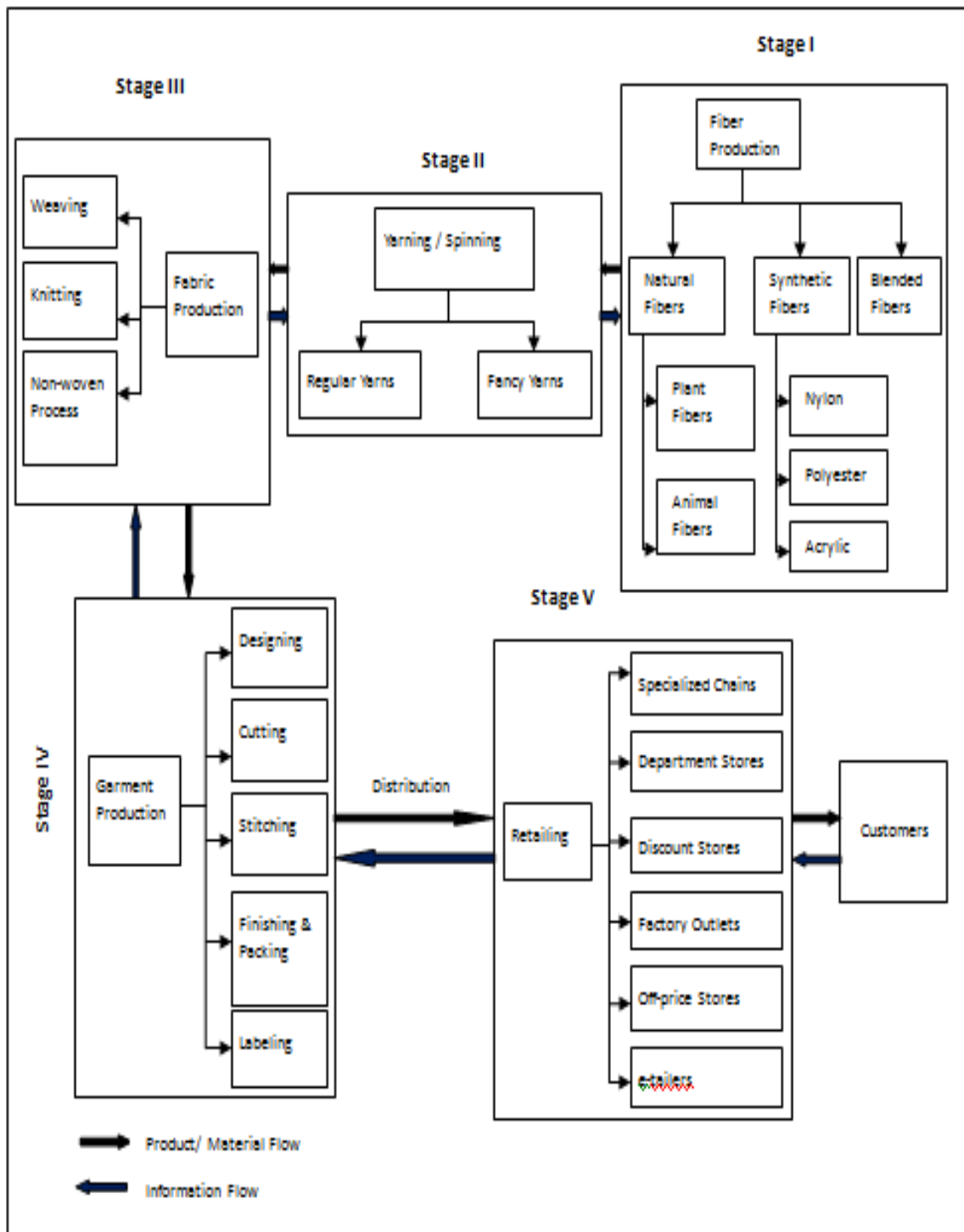


Figure 2.1 stages of production

RESEARCH METHODOLOGY

3.1. Significance of Study

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

3.2. Scope of Study

This document focuses on textile supply chain processes, Due to the complexity of the clothing supply chain the following assumptions were made to restrict the view regarding our objectives and focuses:

1. Textile sectors such as home textiles, technical textiles as well as the fiber manufacturing and their logistics are included.
2. The supply chain processes were analysed from the manufacturer's sourcing logistics at the clothing manufacturer to the sales floor including intermediate logistics Operators and point of sale (POS).
3. The processes described are generic and based on selected distribution channels.
 - a. Distribution channels such as e-commerce and mail order are excluded.
4. Unfinished goods, work wear, accessories, and shoes were not considered.
5. Different sourcing countries and procurement channels may affect processes along
 - a. the supply chain, which are not explicitly outlined

3.3 Research Design

As the research was exploratory in that it addressed a sector where little research into supply chain management had been undertaken previously, then a qualitative approach was chosen, based on detailed case studies to map out particular supply chains and to gain insight into the pattern of supply chain management that was in evidence. To construct the cases, semi-structured interviews were carried out with key stakeholders in the sector and, where available, relevant secondary data were also used, such as company reports, Web sites, etc. The secondary data provided background and context to the primary research data gathered from the interviews. Semi-structured interviews were conducted using an

aide-me 'moiré; to enable comparisons to be made and also to allow some flexibility in the responses made by the research participants. Companies that represented different facets of the textiles and apparel supply chain were selected for the research, ranging from one end of the spectrum, fiber companies, to manufacturers of apparel, to design companies in contract furnishings to, at the other, retailers. Senior managers in product development, design and/or technical functions were approached in the textile and apparel companies, as they were dealing with suppliers. The senior managers worked with customers to understand and exceed their requirements and collaborated with suppliers to capture innovative ideas within cost parameters. In retailing, senior managers responsible for product development, purchasing and/or supply chain management were approached, again as these had relevant knowledge for the research. These managers were contacted by letter, which explained the purpose of the research and asked for co-operation, and then by telephone to provide more details and to arrange interviews. Once interviews had been confirmed, then face-to-face interviews were carried out and these lasted approximately one to two hours each.

3.4 Analytical Tool

To construct the cases, semi-structured interviews were carried out with key stakeholders in the sector and, where available, relevant secondary data were also used, such as company reports, Web sites, etc. Companies that represented different facets of the textiles and apparel supply chain were selected for the research, ranging from one end of the spectrum, fibre companies, to manufacturers of apparel, to design companies in contract furnishings to, at the other, retailers. Senior managers in product development, design and/or technical functions were approached in the textile and apparel companies, as they were dealing with suppliers. These managers were contacted, which explained the purpose of the research and asked for co-operation, and then by telephone to provide more details and to arrange interviews. Once interviews had been confirmed, then face-to-face interviews were carried out and these lasted approximately one to two hours each. There were many cross questions in the expert interview case still the main question set is framed in the appendix.

3.5. Sample Design

Size of Sample: The sample size selected for the study is 18

Parameters of interest: The major parameter of interest is the group of people who are working professional in the textile industry and some of the largest industry including Vardhman Threads, Arvind Mills

SCM & LOGISTICS IN INDUSTRY

4.1. The Textile and Apparel Supply Chain

The Textile and Apparel Supply Chain comprises diverse raw material sectors, ginning facilities, spinning and extrusion processes, processing sector, weaving and knitting factories and garment (and other stitched and non-stitched) manufacturing that supply an extensive distribution channel. This supply chain is perhaps one of the most diverse in terms of the raw materials used, technologies deployed and products produced.

This supply chain supplies about 70 per cent by value of its production to the domestic market. The distribution channel comprises wholesalers, distributors and a large number of small retailers selling garments and textiles. It is only recently that large retail formats are emerging thereby increasing variety as well as volume on display at a single location. Another feature of the distribution channel is the strong presence of 'agents' who secure and consolidate orders for producers. Exports are traditionally executed through Export Houses or procurement/commissioning offices of large global apparel retailers.

It is estimated that there exist 65,000 garment units in the organized sector, of which about 88 per cent are for woven cloth while the remaining are for knits. However, only 30–40 units are large in size (as a result of long years of reservation of non-exporting garment units for the small scale sectors – a regulation that was removed recently). While these firms are spread all over the country, there are clusters emerging in the National Capital Region (NCR), Mumbai, Bangalore, Tirupur /Coimbatore, and Ludhiana employing about 3.5 mn people. According to our estimate, the total value of production in the garment sector is around Rs.1,050–1,100 bn of which about 81 per cent comes from the domestic market. The value of Indian garments (eg. saree, dhoti, salwar kurta, etc.) is around Rs.200–250 bn. About 40 per cent of fabric for garment production is imported – a figure that is expected to rise in coming years. The weaving and knits sector lies at the heart of the industry. In 2004-05, of the total production from the weaving sector, about 46 per cent was cotton cloth, 41 per cent was 100% non-cotton including khadi, wool and silk and 13 per cent was blended cloth. Three distinctive technologies are used in the sector – handlooms, power looms and knitting machines. They also represent very distinctive supply chains. The handloom sector (including khadi, silk and some wool) serves the low

and the high ends of the value chain – both mass consumption products for use in rural India as well as niche products for urban & exports markets. It produces, chiefly, textiles with geographical characterization (e.g., cotton and silk sarees in Pochampally or Varanasi) and in small batches. Handloom production in 2003-04 was around 5493 mn sq.meters of which about 82 per cent was using cotton fiber. Handloom production is mostly rural (employing about 10 million, mostly, household weavers) and revolves around master-weavers who provide designs, raw material and often the loom.

Weaving, using power looms, was traditionally done by composite mills that combined it with spinning and processing operations. Over the years, government incentives and demand for low cost, high volume, standard products (especially sarees and grey cloth) moved the production towards power loom factories and away from composite mills (that were essentially full line variety producers). While some like Arvind Mills or Ashima transformed themselves into competitive units, others gradually closed down. In 2003-04, there remained 223 composite mills that produced 1434 mn. sq. mts. of cloth. Most of these mills are located in Gujarat and Maharashtra. Most of the woven cloth comes from the power looms (chiefly at Surat, Bhiwandi, NCR, Chennai). In 2005, there were 425,792 registered power loom units that produced 26,947 mn. sq. mts of cloth and employed about 4,757,383 workers. Weaving sector is predominantly small scale, has on an average 4.5 power looms per unit, suffers from out dated technology, and incurs high co-ordination costs. Knits have been more successful especially in export channels. Strong production clusters like Tirupur and Ludhiana have led to growth of accessories sector as well, albeit slowly. The hosiery sector, on the other hand, has largely a domestic focus and is growing rapidly.

The spinning sector is perhaps most competitive globally in terms of variety, unit prices and production quantity. Though cotton is the fiber of preference, man-made fiber (polyester fiber and polyester filament yarn) is also produced by about 100 large and medium size producers.

Spinning is done by 1566 mills and 1170 Small and Medium Enterprises (SME). Mills, chiefly located in North India, deploy 34.24 mn. spindles and 0.385 mn rotors while the SME units produce their yarn on 3.29 mn spindles and 0.119 mn. rotors producing 2270 mn kg of cotton yarn, 950 mn kg of blended yarn and about 1106 mn kg of man-made filament yarn every year. Worsted and non-worsted spindles (producing woollen yarn) have also progressively grown to 0.604 mn and 0.437 mn respectively. Spinning sector is

technology intensive and productivity is affected by the quality of cotton and the cleaning process used during ginning. The processing sector, i.e., dyeing, finishing and printing is mostly small in scale. The largest amongst these would dye and finish about 5000 m/day. The remaining are independent process houses (or part of composite mills) that use automated large batch or continuous processing and have an average scale of about 20,000 m of cloth daily. About 82.5 per cent or 10,397 units are hand processors who dye cloth or yarn manually and dry in open sunshine. Of the remaining (and these use automated and semi-automated equipment), 2076 are independent process houses.

Cotton remains the most significant raw material for the Indian textile industry. In 2003-04, 3009 mn kg of cotton was grown over 7.785 mn acres. Other fibers produced are silk (15742tonnes), jute (10985000 bales), wool (50.7 mn kg) and man-made fibers (1100.65 mn kg). Cotton grows mostly in western and central India, silk in southern India, jute in eastern and wool in northern India. Significant qualities of cotton, silk and wool fibers are also imported by the spinning and knitting sectors. (Except for garments, all data in this section was obtained from OTC 2004 and Texmin 2005.)

Managing such a complex supply chain requires coordination through excellent managerial practices, technology and facilitating policies.

4.2. Competitiveness of Indian Textile & Apparel Industry

India is one of the few countries that owns the complete supply chain in close proximity from diverse fibers to a large market. It is capable of delivering packaged products to customers comprising a variety of fibers, diverse count sizes, cloths of different weight and weave, and panoply of finishes. This permits the supply chain to mix and match variety in different segments to deliver new products and applications. This advantage is further accentuated by cost based advantages and diverse traditions in textiles.

Indian strength in spinning is now well established – on unit costs on ring yarn, open-ended (OE) yarn as well as textured yarn, Indian firms are ahead of their global competitors including China.

Same is true on some woven OE yarn fabric categories (especially grey fabrics) but is not true for other woven segments. India contributes about 23 per cent of world spindles and 6 per cent of world rotors (second highest in the world after China). Fifty five per cent of total investment in technology in the last decade has been made in the spinning sector. Its share in global shuttleless loom, however, is only about 2.8 per cent of world looms (and is

ranked 9th in the world). The competitiveness in the weaving sector is adversely affected by low penetration of shuttle less looms (i.e., 1.69 % of Indian looms), the unorganized nature of the sector (i.e., fragmented, small and, often, un-registered units, low investment in technology & practices especially in the powerloom, processing, handloom and knits) and higher power tariffs. There is, however, a recent trend of investment in setting up hi-tech, stand-alone mid-size weaving companies focusing on export markets. India also has the highest deployment of handlooms in the world (handlooms are low on productivity but produce specialized fabric). While production and export of man-made fiber (and filament yarn) has increased over the years, Indian industry still lags significantly behind US, China, Europe, Taiwan etc. (Texmin, 2005.)

Indian textile industry has suffered in the past from low productivity at both ends of the supply chain – low farm yields affecting cotton production and inefficiency in garment sector due to restriction of size and reservation. Add to this, contamination of cotton with consequent increase in cost (as it affects quality and requires installation of additional process to clean and open cotton fibers before carding operations), poor ginning (most equipment dates back to 1940s), high average defect rates in production process (which also leads to increase in effective labor and power costs), hank yarn requirement, etc. and its competitiveness gets compromised severely. Similarly, processing technology is primarily manual and small batch oriented with visual colour matching and sun drying. This leads to inconsistency in conformance quality. Lead times across the sector continue to be affected by variability in the supply chain – defect rates average over 5%, average % of orders on time is about 80%, variance in order size across firms is high (e.g., the coefficient of variability of average order size for spinning firms is about 2.6), and on an average, 16 days of sales as work-in-process inventory (the highest for garment firms) and an average of 30 days of sales in raw material inventory (the highest for spinning firms). Some of the hurdles (eg., reservation in the garment sectors) including tariff distortions between the organized and unorganized sectors have now been systematically removed by policy initiatives of Government of India and have opened avenues for firms to compete on the basis of their capabilities.

Trade data of post-MFA performance reveals some interesting trends – Indian firms registered a 27 per cent growth in exports to US (against China's 52 per cent) during the Jan-April 2005 time period. Most of this growth has been in textiles while apparels show marginal gains. Apparels & accessories constituted 78% of global exports to USA (FICCI

2005). (India is still a relatively small yet growing player in the global apparel market.) It is expected that India will soon replace

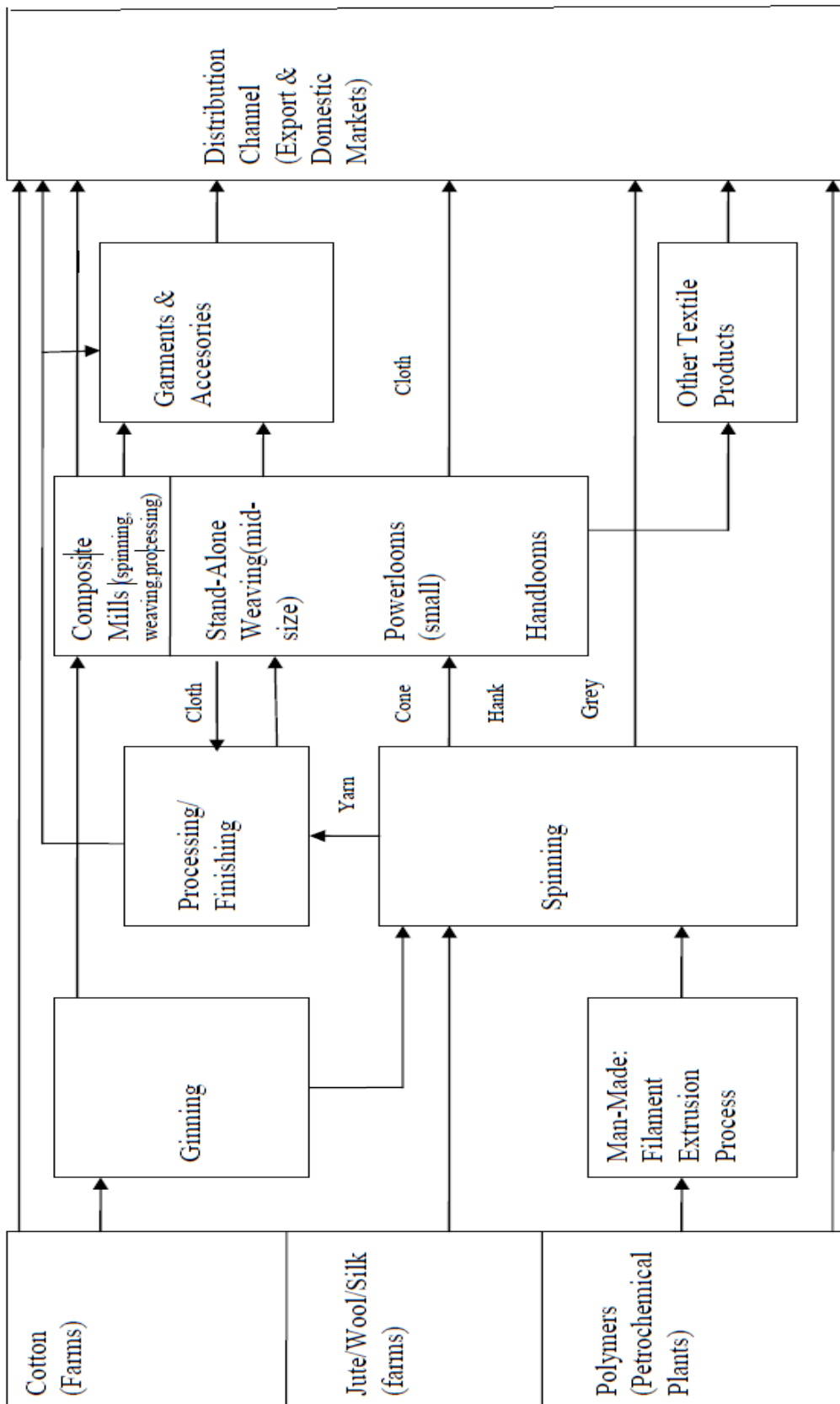


Figure 4.1 Supply Chain in textile industry

4.3. Challenges facing Indian Textile and Apparel Industry

Textile supply chains compete on low cost, high quality, accurate delivery and flexibility in variety and volume. Several challenges stand in the way of Indian firms before they can own a larger share of the global market:

1. **Scale:** Except for spinning, all other sectors suffer from the problem of scale. Indian firms are typically smaller than their Chinese or Thai counterparts and there are fewer large firms in India. Some of the Chinese large firms have 1.5 times higher spinning capacity, 1.25 times denim (and twice as grey fabric) capacity and about 6 times more revenue in garment than their counterparts in India thereby affecting the cost structure as well as ability to attract customers with large orders. The central tendency is to add capacity once the order has been won rather than ahead of the demand. Customers go where they see both capacity and capabilities. Large capacity typically goes with standardized products. These firms need to develop the managerial capabilities required to manage large work force and design an appropriate supply chain. For the size of the Indian economy, it will have to have bigger firms producing standard products in large volumes as well as small and mid size firms producing large variety in small to midsize batches (the tension between the organized and un-organized sectors will have to be addressed first, though). Then there is the need for emergence of specialist firms that will consolidate orders, book capacities, manage warehouses and logistics of order delivery.

2. **Skills :** Three issues must be mentioned here :

(a) There is a paucity of technical manpower – there exist barely 30 programs at graduate engineering (including diploma) levels graduating about 1000 students – this is insufficient for bringing about technological change in the sector;

(b) Indian firms invest very little in training its existing workforce and the skills are limited to existing processes;

(c) There is an acute shortage of trained operators and supervisors in India. It is expected that Indian firms will have to invest close to Rs. 1400 bn by year 2010 to increase its global trade to \$ 50 bn. This kind of investment would require, by our calculations, about 70,000 supervisors and 1.05mn operators in the textile sector and at least 112,000

supervisors and 2.8mn operators in the apparel sector (assuming a 80:20 ratio of investment between textiles and apparel). The real bottleneck to growth is going to be availability of skilled manpower.

3. Cycle Time : Cycle time is the key to competitiveness of a firm as it affects both price and delivery schedule. Cycle time reduction is strongly correlated with high first pass yield, high throughput times, low variability in process times, low WIP and consequently cost. Indian firms have to dramatically reduce cycle times across the entire supply chain which are currently quite high (Chandra, 2004). Customs must provide a turnaround time of ½ day for an order before Indian firms can they expect to become part of larger global supply chains. Indian firms need a strong deployment of industrial engineering with particular emphasis on cellular manufacturing, JIT and statistical process control to reduce lead times on shop floors. Penetration of IT for improving productivity is particularly low in this sector.

4. Innovation & Technology: A review of the products imported from China to USA during January–April 2005 reveals that the top three products in terms of percentage increase in imports were Tire Cords &/////////7/ Tire Fabrics (843.4% increase over the previous year), Non-woven fabrics (284.1% increase) and Textile/Fabric Finishing Mill Products (197.2% increase) None of these items, however, figure in the list of imports from India that have gained in these early days of post-MFA. Entry into newer application domains of industrial textiles, nano textiles, home furnishings etc. becomes imperative if we are to grow beyond 5–6% of global market share as these are areas that are projected to grow significantly. Synthetic textiles comprise about 50 per cent of the global textile market. Indian synthetic industry, however, is not well entrenched. The Technology Up gradation Fund of the government is being used to stimulate investment in new processes. However, there is little evidence that this deployment in technology has accompanied changes in the managerial regimes – a necessary condition for increasing productivity and order winning ability.

5. Domestic Market : The Indian domestic market for all textile and apparel products is estimated at \$26 bn and growing. While the market is very competitive at the low end of the value chain, the mid or higher ranges are overpriced (i.e., ‘dollar pricing’). Firms are not taking advantage of the large domestic market in generating economies of scale to deliver cost advantage in export markets. The Free Trade Agreement with Singapore and Thailand will allow overseas producers to meet the aspirations of domestic buyers with

quality and prices that are competitive in the domestic market. Ignoring the domestic market, in the long run, will peril the export markets for domestic producers. In addition, high retail property prices and high channel margins in India will restrict growth of this market. Firms need to make their supply chain leaner in order to overcome these disadvantages.

6. Institutional Support: Textile policy has come long ways in reducing impediments for the industry – sometimes driven by global competition and, at other times, by international trade regulations. However, few areas of policy weakness stand out – labor reforms (which is hindering movement towards higher scale of operations by Indian firms), power availability and its quality, customs clearance and shipment operations from ports, credit for large scale investments that are needed for up gradation of technology, and development of manpower for the industry. These are problems facing several sectors of industry in India and not by this sector alone. In conclusion, competitive strategies are developed by sector level firms and its their individual and collective initiatives that secure higher market share in global trade. While one has to be ever vigilant of non-tariff barriers in the post MFA world, the new market will be won on the basis of capabilities across the supply chain. Policy will need to facilitate this building of capabilities at the firm level and the flexible strategies that firms will need to devise periodically.

4.4. Weak points in forward supply chain logistics

The general forward logistics of a clothing supply chain was analyzed in terms of weaknesses starting at the manufacturers outgoing/preparation area to the end consumer. Shows the main flows of the clothing supply chain. Individual process steps are visualized based on the input provided by three textile companies and a hyper and supermarket, which are working in the project. Below the process flow with its weak points is described in detail

1. From the clothing manufacturer to the distribution center

At the outgoing and preparation area of a clothing manufacturer the delivery will be prepared to meet the purchase order of a retailer. Mixed transport units will be picked and compiled according to the supply order. At the next step the transport unit will be labeled and after the printing of the delivery note the truck will be loaded at the dock doors for the dispatch to the distribution center. Processes such as reconditioning and storage may apply, but will be considered at the distribution center, as the processes will be similar.

2. Direct store delivery (DSD)

At the outgoing and preparation area of a clothing manufacturer the delivery will be prepared to meet the purchase order of a retail shop. Garments will be picked from storage, compiled to a transport unit, labeled and finally shipped with the printed shipping documents.

a) The weak points at the manufacturer:

In the manufacturers' storage area processes usually are very efficient. The challenge is to ensure the accurate configuration of transport units for either retail stores or distribution centers in time.

- i. The manufacturer usually gets little information regarding sales and store availabilities of the garments. Hence the forecast quality is often not very reliable. In many cases electronic data interchange (EDI) is used between manufacturer and retailer/distribution center to guarantee the information flow. Nevertheless the time delayed transmission of sales and inventory reports typically cause problems to the manufacturer to identify the exact store inventory..
- ii. For direct store deliveries (DSD) the picking processes require a lot of time. It is usually labor intensive work as the mixed transport units have to be collected from the storage area. In addition, errors may occur during picking processes and the updating of inventory management systems. The depth and range of a product line also have to be considered. For instance a high number of different sizes and colors does require higher process optimization than a limited product line.

3. Distribution Center

Distribution centers are the foundation of a retailing network. They could be run by manufacturers, retailers or service providers. Each center usually supplies a number of stores. The principal task of a distribution center is the reception of large quantities of garments and to ship small quantities to individual stores. This avoids the time-consuming processes of garment receptions from multiple suppliers at individual stores. A second point is the storage of garments to guarantee the timely replenishment of the retail shops. The process flow may vary after the reception of the transport units and the quantity control. Further functions such as reconditioning processes, cross docking, and storage can

apply.

a) *Receiving area*

At the receiving area all incoming goods are unloaded and the quantity will be checked and verified before the goods will be transported to further processing areas.

The weak points:

- i. The manual verification of deliveries requires time and may cause errors.

b) *Reconditioning processes:*

At the reconditioning area, goods will be unpackaged and prepared for the store. Such processes are ironing, hanging up of items, and attaching price labels as well as security tags. They may also apply at the manufacturer site. Depending on the flow, the garments will be shipped to the storage area or to the cross docking area.

- ii. The tracking and tracing of garments through the reconditioning processes is difficult to organize. Often a “black box” in data and physical process flows may exist, which makes it difficult to provide accurate information regarding the current location of garments.
- iii. Due to the difficulties to locate garments, items may get lost. Also theft and shrinkage may occur. This will significantly slow down the lead times.

(c.) *Cross Docking processes*

Cross docking is a practice of unloading products from an incoming truck and loading these products in outbound trucks, with nearly no storage in between. In the clothing supply chain this may be done to sort clothing intended for multiple different stores, or to combine clothing from different origins for stores. A transport unit will be picked and compiled to meet a purchase order from a store. Finally the transport unit will be labeled and shipped to the outgoing area of the distribution center.

The weak points:

- i. As already described above, the verification as well as the picking and

packaging processes for the consolidation of transport units may cause delays and errors.

- ii. The high degree of labor-intensive and time-critical processes may cause bottlenecks in the whole operations.
- iii. Unpredictable events such as late receptions may cause delays, which will affect the whole cross docking processes.
- iv. Inaccurate data through misplaced items, shrinkage, and theft will lead to differences between data and physical process flows.
- v. These problems can lead to wrong, late, inaccurate, and incomplete deliveries to retail stores

(d).Warehousing of clothing

One of the main functions of distribution centers is the storage of products until needed by the retail location. They ensure the replenishment of stores and may require un packaging processes. Regularly inventory controls shall ensure the availability of products. The picking of items and the consolidation of transport units is be done to meet the purchase orders of the destined shops and dispatched to the outgoing area

The weak points:

- i. Regular inventory captures require time and labor and will increase storage costs. Still the inventory data will not be updated continuously. This forces companies to have higher storage amounts and costs to compensate discrepancies caused by theft, shrinkage, data errors, wrong storage, etc.
- ii. Yet replenishment cannot be guaranteed when the demand of stores fluctuates significantly.
- iii. Another important issue is the obsolescence of garments which may be detected too late. Through an increasing number of collections and higher stock turnovers, the non-detection of obsolescent garments may cause depreciations.
- iv. Further already mentioned weak points are: picking errors, delays, etc.

(e.)Outgoing area

At the outgoing area, transport units will be shipped to the multiple retail shops. The goods will either come from the cross docking area or the storage area. Usually the transport units are already compiled for dispatch

and only the shipping documents will be printed before the truck is loaded.

The weak points:

- i. At the outgoing area, already aggregated transport units could be loaded in the wrong truck and shipped to a wrong destination.

4. Retail store – back store

The back store of a retail shop has two main functions. The reception of clothing from distribution centers or manufacturers is the first function. Along with the unloading of the truck, the verification of delivered items is done. At a next step items will be selected for storage in the back store or for the display in the front store. The second function is the replenishment of the sales floor.

The weak points:

- a) The verification of incoming deliveries requires time and labor.
- b) If those deliveries are not accurate, additional time consuming processes such as identifying missing garments, placing additional purchase orders, or even returning wrong deliveries may occur. If delivery errors are not detected, there will be discrepancies between data and physical inventory.
- c) Delays during previous processes at the manufacturer or distribution center will lead to out of stock (OOS) situations at the retail store. This will affect sales, when garments are not available.
- d) Because of the continuous replenishment of the front store, the inventory of the back store cannot be exactly identified. Garments may be placed at the front store or the back store. Therefore the tracking and tracing of garments is not guaranteed.
- e) High labor costs may apply for locating items in front and back stores. Additional regularly inventory controls have to be executed to achieve an overview of the items in the store.

5. Sales floor

At the sales floor the garments will be placed on shelves or rails. The main responsibility of sales staff is to provide customer service. The second duty is the already mentioned replenishment of items from the back store. Inventory checks on the sales floor and the replacement of misplaced garments to the original shelf or hanger are also part of the

processes.

The weak points:

- a) The searching and replenishment of items will bind service staff and therefore lead to less time for customer service because of additional handlings.
- b) Due to the time consuming processes on the sales floor, more staff is needed to provide service, accurate item availability and correct inventory.
- c) Theft and shrinkage on the sales floor will lead to inaccurate inventory data. Regular inventory controls are also essential on the sales floor.
- d) The retailer does not get any information about item movements on the sales floor. Helpful information, why a customer does not buy selected items are not detected (e.g., tracking items from fitting room to shelf).
- e) Customers are not able to check the availability of items by themselves. If the sales staff is busy with store operations, potential sales might be lost.

6. Store-to-store transfers

Store-to-store transfers occur when single shops have an oversupply which cannot be sold. Stores might also offer item transfers between shops according to the customers' requests. After checking the availability, for example, by checking the computer system or calling a store, the garment will be picked in the back store or the front store, verified, packaged, and then dispatched to the outgoing area and finally to the shop

The weak points:

- a) A multitude of additional manual processes such as locating, verifying, packaging and shipping processes are added to the already time-consuming store operation processes.

7. Point of sale (POS)

At the point of sale, each garment has to be identified, for example, by scanning the barcode. The security tag is detached. After the paying process all items are put in a bag and handed over to the customer.

The weak points:

- a) Long queues at the point of sale often cause a great source of dissatisfaction for costumers. Although this usually happens only at the main shopping hours or

before Christmas, this problem can be found in nearly all business models with shops.

- b) Furthermore, returns are usually not possible if the customer has lost or forgotten the receipt. In this case, the stores are not able to track, where the product was purchased.

4.5 Weak points in return logistics

Return logistics apply when customers return clothing because of complaints company start product recalls, or Items could not be sold on the sales floor

This clothing may be returned to the distribution center or to the manufacturer. Depending on quality and price the returned garments will either be pushed on the market through other distribution channels (such as factory outlets, low priced fashion retailers, or other stores) or destroyed. These processes are typically relatively time intensive, as they are labor-intensive processes, which usually do not provide much benefit and in many cases no benefit at all. The return flow will be described as well. The weaknesses may be similar compared to the forward processes and will therefore only be summarized. The individual process steps based on input provided from three textile companies and a hyper- and supermarket, which are working in this work package.

8. Customer Returns in Store

Customer returns will be received by the staff at the point of sale (POS). The items will be identified by receipt and label, if it is still attached. The returned garments might be displayed again in the store after a quality check. In this case new labels and security tags must be attached. Garments that cannot be sold in the store will be returned to either the distribution center or the manufacturer.

9. Back store

Garments dispatched to the distribution center or the manufacturer will be stored temporarily at the back store. After quantities are verified, security tags and labels will be detached and then the garments are shipped to their destination.

10. Distribution Center

At the distribution center the returned garments are identified and the quantity will be checked. When garments are faulty, they might temporarily be stored and then either

returned to the manufacturer or put on the market through other distribution channels.

11. Manufacturer

The manufacturer verifies the items

The weak points of reverse logistics

- a) Reverse logistics usually cause costs that cannot be put against a return on investment. Therefore the process-related efforts amount for additional costs, which may not provide any benefit at all. Looking at the different areas of the process chain, problems can be identified in the store, at the distribution center, and finally at the manufacturer. As these processes can be compared to the already identified processes in forward logistics, the individual weak points will not be explained separately. The main problems are
- b) Picking errors
- c) Increase in manual operations
- d) Insufficient transparency and related tracking and tracing problems
- e) Discrepancies between physical flow and inventory management system

As a consequence, additional labor and time is required, which will cause costs and decrease productivity.

4.6 Possible consequences of weak points

The identified process-related weak points apply to all business models on a larger or lower scale. On the one hand logistic processes will be inefficient, which will affect costs and on the other hand the sales will be affected. Time-consuming processes, errors, and insufficient process transparency will cause inaccurate inventory and forecast quality, and higher time-to-market processes to name a few consequences. As a result, the costs will increase by more labor and storage costs, shrinkage, theft, depreciations of overstock, and also illicit trade.

The various dependencies and intersections of the weak points make it difficult to identify the correlation of the overlapping processes. For a better understanding the consequences of the individual weak points are summarized:

1. Transparency of the supply chain

The transparency of the supply chain is often insufficient. The EU Directive 1081/2003 for

non food products forces companies involved in the supply chain to record ingoing and outgoing merchandise or parts. Due to a weak automation of multiple clothing companies a registry often cannot be generated automatically. In addition, the management of a withdrawn product requires a very deep traceability with a high degree of granularity. Depending on the automation process, this problem is more or less significant for all business models.

Inadequate transparency can result in a series of reactions of further challenges such as out of stock (OOS) situations, late replenishment, and further labor for locating stock and items in stores and warehouses. Inaccurate inventory will cause higher stocks to guarantee replenishment processes. Furthermore shrinkage, theft, and illicit trade might not be detected or noticed too late. Also obsolescence and overstock will be realized late, which may cause depreciations. The whole productivity will be affected and the final result will be higher costs and fewer sales through OOS situations and less customer service.

2. Out of stock situation (OOS)

An out-of-stock situation may occur when a product demand from a customer cannot be satisfied immediately. OOS situations may apply to nearly all business models such as specialized chains, independent multi-brand stores, or even hyper- and supermarkets. Exceptions may occur in the case of promotional sales, which are pushed to the stores and not replenished. The out of stock situation can be explained by many reasons. The most common reasons are:

- a) Errors in the demand forecast,
- b) Delays and errors in the dispatch or reception of products,
- c) Unexpected demand,
- d) Discrepancies between physical and data related inventory.
- e) Illicit trade and
- f) Lack of on shelf availability, even if it is available in the back room or in another place of the store (for example, wrong shelf or left items in a fitting room).

3. Operational efficiency

The exact verification of deliveries does require manual quantity controls, for instance by reading each barcode manually to update the inventory system. These are time-consuming

and labor-intensive processes. Furthermore regular manual inventory controls are necessary because discrepancies always exist on a higher or lower scale. In the supply chain, manual verifications appear at multiple points: at the reception, during storing and picking processes in warehouses, when items are shipped, etc.

4. Shrinkage

Shrinkage is mainly due to external and internal theft, or shipments of products to an incorrect destination. It does apply to all business models on a varying degree of importance. The degree of shrinkage is influenced by factors such as the automation degree, process optimization, and workforce culture.

5. Management of obsolescence and depreciations

In the clothing sector, most products have a limited commercial life cycle. Because of the high rotation of merchandise, obsolescent goods may not be detected due to a non-existing or inefficient inventory management in the retail store or warehouse. Necessary measures such as price reductions to prevent this obsolescence may not be conducted in time. The obsolescence can be found for instance at department stores, private label fashion, and also brand fashion.

6. Illicit trade

Illicit trade consists of merchandise sales – generally by third parties – at points of sales different than planned by the manufacturer. It could happen that products are turned aside towards markets with higher prices. This deviation reduces the product availability, the market quota and, in some cases, generates the impossibility to manage suitable post sale service, which results in a damaged image of the manufacturer. Illicit trade typically occurs in the high level brand fashion business model. The price margins are comparatively high in this area and therefore considerably profitable.

7. Counterfeiting

The counterfeiting of luxury goods and brand labels is widely spread nowadays. The consequences can vary from the simple loss of sales to greater risks regarding credibility and brand image.

8. Customer service

Time consuming store operations will affect customer service. The sales staffs is often

busy conducting store operations. On this account customers often have to wait and potential sales may get lost. Also OOS situations and insufficient product information will affect customer satisfaction. Customer loyalty may decrease and in the worst case may be completely lost. In addition, most retail stores regardless their business model decline to manage a return or a change if the customer does not have the receipt of payment. The reason is that stores are not able to verify in which establishment and to what price the product has been acquired.

LIMITATIONS & RECOMMENDATIONS

5.1. Limitation of study

This document focuses on textile supply chain processes, Due to the complexity of the clothing supply chain the following assumptions were made to restrict the view regarding our objectives and focuses:

1. Textile sectors such as home textiles, technical textiles as well as the fiber manufacturing and their logistics are included.
2. The supply chain processes were analysed from the manufacturer's sourcing logistics at the clothing manufacturer to the sales floor including intermediate logistics Operators and point of sale (POS).
3. The processes described are generic and based on selected distribution channels.
4. Distribution channels such as e-commerce and mail order are excluded.
5. Unfinished goods, work wear, accessories, and shoes were not considered.
6. Different sourcing countries and procurement channels may affect processes along the supply chain, which are not explicitly outlined

5.2. RECOMMENDATIONS FOR FUTURE RESEARCH

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 information 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. 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.

1. This industry is highly unorganised and divided into segments which make the research so hectic and complex.
2. To sum up all the problems the future research must be done in fragments
3. The different logistics models of lean supply chain and agile supply chain to be considered
4. High customisation and the new product demand will be the main factors which should be considered for the growth of this industry
5. The investment in infrastructure and technology should be done accordingly
6. Government rules and regulations of policies play a vital role.

CONCLUSION

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); 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, 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.

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 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

References

Chandra, P., (2004) “Competitiveness of Indian Textiles & Garment Industry: Some Perspectives,” a presentation, Indian Institute of Management, Ahmedabad, December 2004.

Chandra, P.,(1998) “Technology, Practices, and Competitiveness: The Primary Textiles Industry in Canada, China, and India,” ed. P. Chandra, Himalaya Publishing House, Mumbai,

FICCI, (2005)“Trends Analysis of India & China’s Textiles and Apparel Exports to USA Post MFA,FICCI, New Delhi, July.

Texmin (2005), Official website of Ministry of Textiles, Government of Indian, <http://texmin.nic.in>..

OTC, (2004)“Compendium of Textile Statistics,” Office of Textile Commissioner, Ministry of Textiles, Government of India, Mumbai,.

Yin, R. (1994), Case Study Research Design and Methods, 2nd ed., Sage Publications Inc., Newbury Park, CA, pp. 1-15;84-85.

Abernathy, F.H. (2000), “Retailing and supply chains in the information age”, Technology in Society, Vol. 22, pp. 5-31.

Bhamra, T., Heeley, J. and Tyler, D. (1998), “A cross-sectional approach to new product development”, The Design Journal, Vol. 1 No. 3, pp. 2-15.

Fisher M. L. (1997), “What is the right supply chain for your product”, *Harvard Business Review*, Vol. 75 No.4, pp. 105-116.

Choi, T. M. and Sethi, S. (2010), “Innovative Quick Response Programs: A review”, *International Journal of Production Economics*, Vol. 127 No. 1, pp. 1-12.

Annexure

Questions Expert Interview

1. How would you describe the relationship you have with your suppliers?
2. How is this relationship managed?
3. How is the product manufactured?
4. How is the team working on the logistics?
5. Which functions and people interact with the supplier and/or customer?
6. How would you describe the relationship you have with customers?
7. How integrated is your supply network?
8. How the inventories & sku's managed?
9. Would you consider collaboration with suppliers for product development, or solving a supply problem? Can you give examples of the type of collaboration and why this arose?
10. Do you collaborate with customers for product development and/or innovation?
11. Do you invest in the relationships you have?
12. Can you describe the nature of such investment?
13. Do your supply chain relationships tend to be longer- or shorter-term?
14. Have relationships been terminated, and if so, on what basis?
15. How do you select new suppliers and screen potential new customers?

Adherence Sheet

Particulars	Last Date	Signature of Mentors	
Title of the Project/Area of Topic Finalization	21-Jan-16		
Literature Review/Objectives of the study	02-Feb-16		
Methodology	18-Feb-16		
Questionnaire/Data Collection tools	03-Mar-16		
Data Collection	17-Mar-16		
Analysis	24-Mar-16		
Conclusion and Recommendations	01-Apr-16		
First Draft	15-Apr-16		
Final Report/Binding and Submission	03-May-16		