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Human Resource and Skill Requirements in the Textile Sector (2022) – A Report

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Human Resource and Skill Requirements in the Textile Industry

Study on mapping of human resource skill gaps in India till 2022

Table of Contents

List of Figures

List of Tables

1. Environment Scanning and Competitiveness of Textile sector

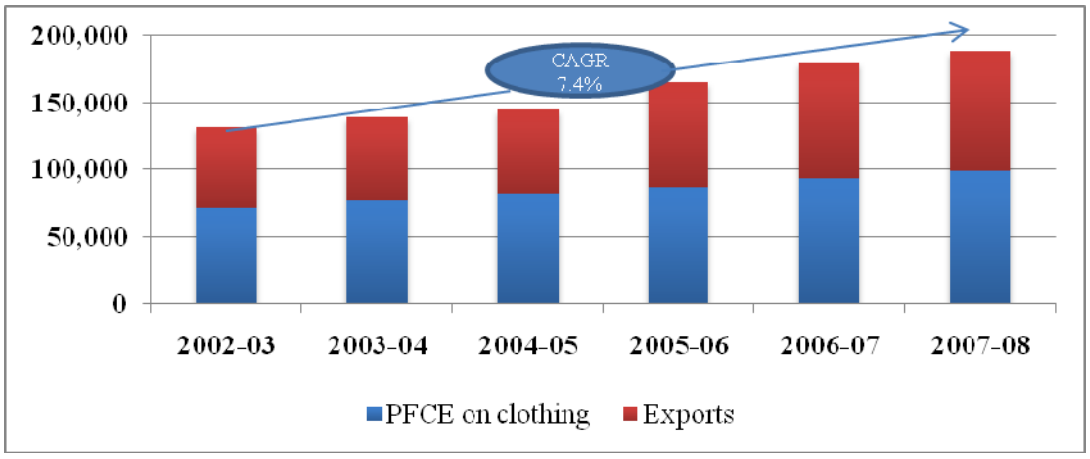
1.1. Overview

Indian Textile and Clothing (T&C) industry is currently one of the largest and most important industries in the Indian economy in terms of output, foreign exchange earnings and employment. The industry contributes 4% to the country's GDP and 14% to the country's industrial production. Indian T&C market is estimated at Rs. 2,00,000 crore (US $ 40 billion) in 2007-08. The textiles industry accounts for around 14% of total exports from India. The textile exports during 2007-08 amounted to US $ 20 billion. The textile imports during the same period stood at Rs 13,400 crore. Indian T&C industry is also the second largest employment generating industry, after agriculture with direct employment of 33.17 million people (as of March 2006)[1]. The value chain comprises of spinning, weaving, knitting and garmenting. Also, it uses different materials such as cotton, jute, and wool, silk, man-made and synthetic fibres.

1.2. Industry Size and Growth

The size of the textile industry is estimated by means of private final consumption on clothing and export value of textile products from India .The Private Final Consumption Expenditure (PFCE) on clothing was in excess of Rs 99,000 crore in 2007-08. The Compound Annual Growth Rate (CAGR) of PFCE on clothing for the last five years was 6.85%.

Figure 1: PFCE on clothing and exports in the Textile industry (in Rs. crore)

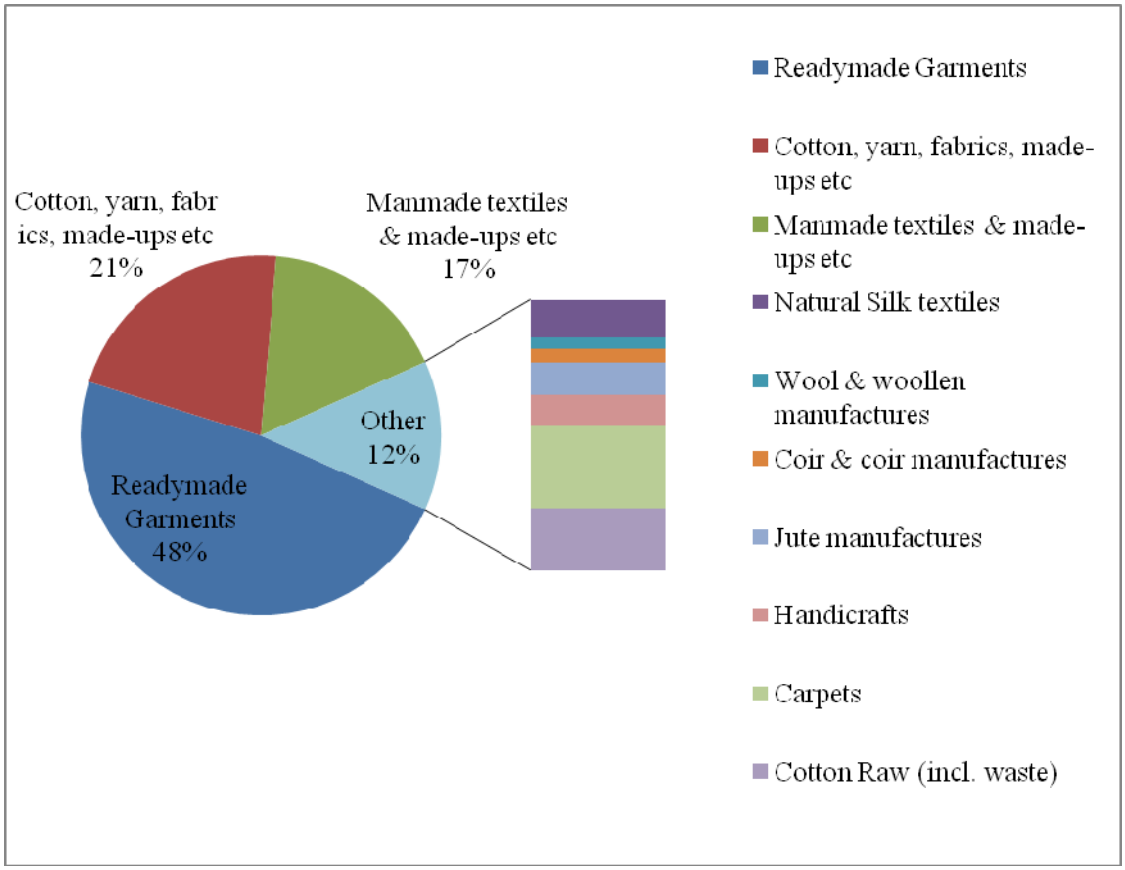


Source: DGFT, CSO, IMaCS analysis; Note: PFCE at current prices

[1] *This also includes employment in Handloom, Sericulture, Handicraft and Jute industry.*

The bulk of India's T&C exports, as well as most export growth, are in cotton-based yarns, fabrics, clothing, and household furnishings, as opposed to synthetic and blended products. The industry has significant dependence on exports with EU27 being the largest export market, accounting for 33% of the total T&C exports by value in 2007-08. US is the second largest export market for Indian T&C products with a share of 21% by value of total T&C exports in 2007-08. Other important export markets are UAE (6%), China (5%), Bangladesh (3%) and Japan (1%).

Figure 2: Share in Indian T&C Exports (2007-08)

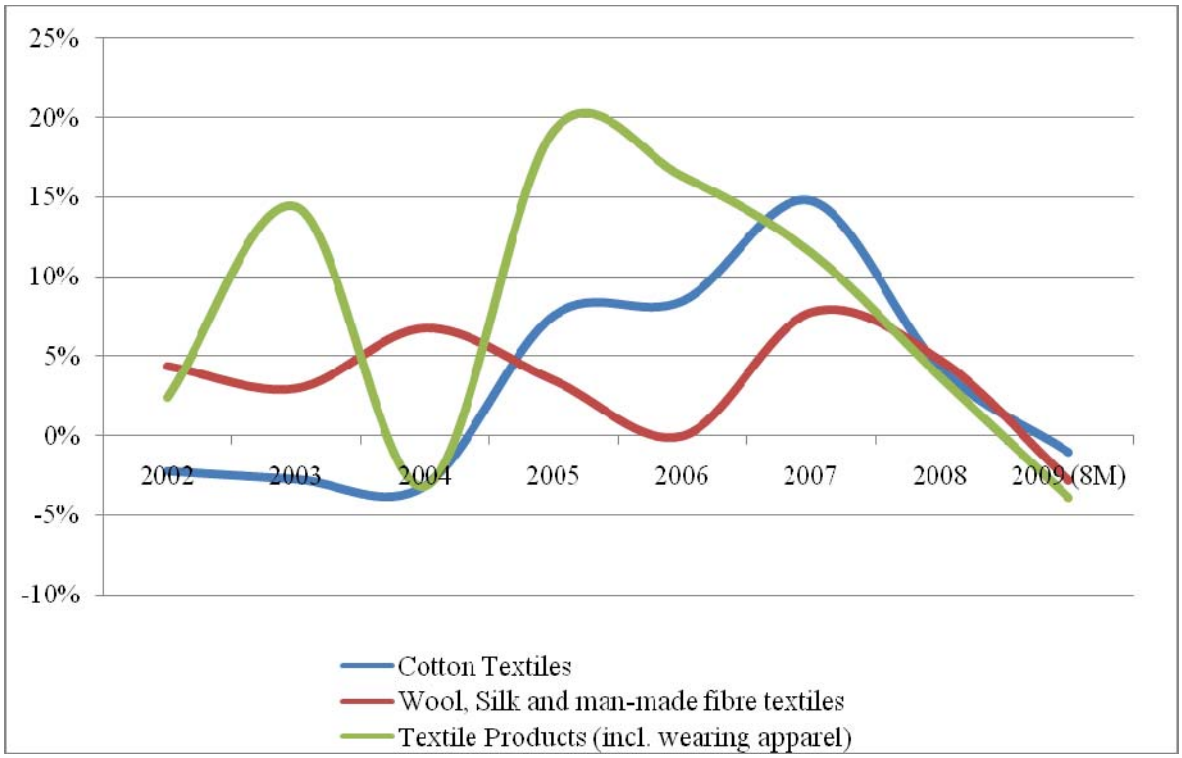


Source: DGFT, IMaCS Analysis

The recent economic slowdown has significantly impacted the major export markets of Indian T&C industry i.e. EU27, US and Japan thus negatively impacting the Indian T&C industry.

During Apr – Dec 2008, India's garment exports grew by 7% (Y-O-Y) as against a growth of 9% (Y-O-Y) in FY08. India's Textile exports declined by 4% (Y-O-Y) as against a growth of 21% (Y-O-Y) in FY08.

Figure 3: Annual Growth in IIP for Textile Products



Source: CSO, IMaCS Analysis

Production growth moderated significantly during 2007-08 and H12008-09.The slowdown in 2007-08 was primarily because of higher domestic prices, and the rupee appreciation which resulted in a sharp slowdown in exports.

The decline in 2008-2009 was due to dampening of domestic demand on account of continued high prices and a sharp slowdown in export demand. The recent economic slowdown has significantly impacted the major export markets of Indian T&C industry i.e. EU27, US and Japan thus, negatively impacting the Indian T&C industry.

However, despite the recent economic slowdown and certain targets being missed, the long term outlook remains positive. The Ministry of Textiles has targeted a growth of 16% per annum for the Indian T&C industry to reach US $ 115 billion by the end of Eleventh Five Year Plan[2]. It also wants to secure a 7% share in global T&C trade by the end of the Eleventh Five Year Plan. Provided the

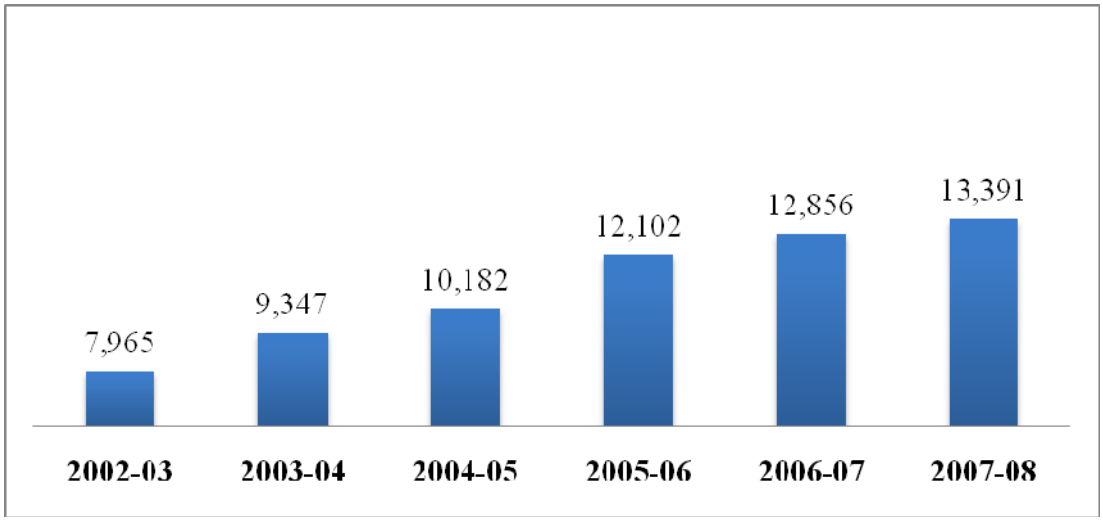
[2] *Report of the Working Group on Textiles & Jute Industry for the Eleventh Five Year Plan*

targeted growth is achieved, Indian T&C industry has potential to employ 45 million[2] people by 2012. Further, the export earnings from this industry are estimated to increase to US $ 55 billion[2] by 2012.

Imports

The total textile imports in 2007-08 amounted to Rs. 13,400 crore. The ratio of imports to PFCE on textiles and textile exports is 7.1% in 2007-08 compared to 6% in 2002-03. Yarns and fabrics accounted for more than 50% of the imports.

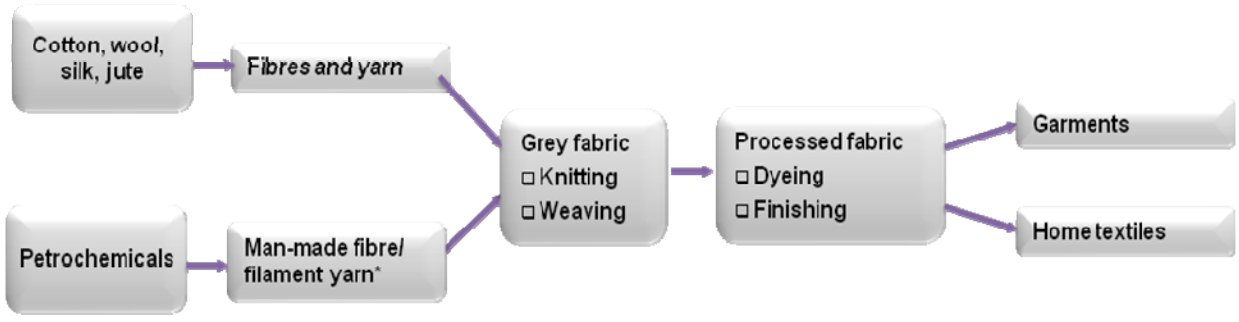
Figure 4: Textile Imports (Rs. crore)



Source: DGFT, IMaCS Analysis

1.3. Value chain of the Textile sector

Figure 5: Value chain of the Textile sector



**Includes viscose staple fibre, polyester staple fibre, acrylic staple fibre, viscose filament yarn, nylon filament yarn, polyester filament yarn*

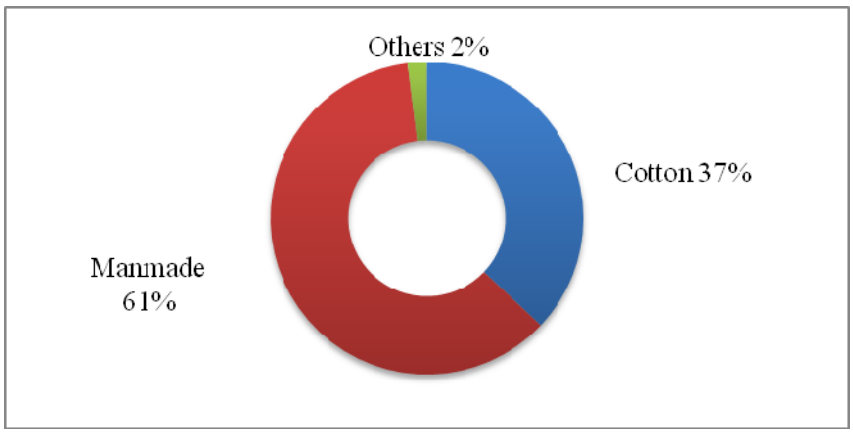
Yarns

The spun cotton yarn industry processes raw cotton from gins into yarns of various counts (degree of fineness) through a series of operations like fibre opening, cleaning, carding, combing, drafting, roving and ring spinning.

Fibre/Filaments

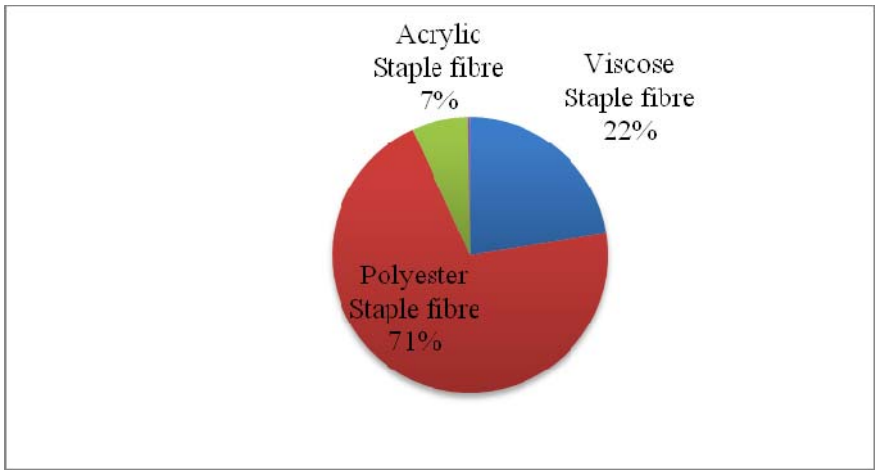
India's fibre consumption constituted 62% by volume of cotton unlike world fibre consumption in which man-made fibre constitutes 60%.

Figure 6: Fibre-wise share in total world fibre consumption



India is one of the largest producers of man-made fibres in the world with a production of 1.24 million MT of man-made staple fibre and 1.5 million MT of man-made filament yarn in 2007-08.The country accounts for 7% of the total man-made fibre production in the world. Polyester is the most common fibre/filament; polyester staple fibre accounts for 71% of the total man-made staple fibre production while polyester filament yarn accounts for 94% of the total filament yarn production in India.

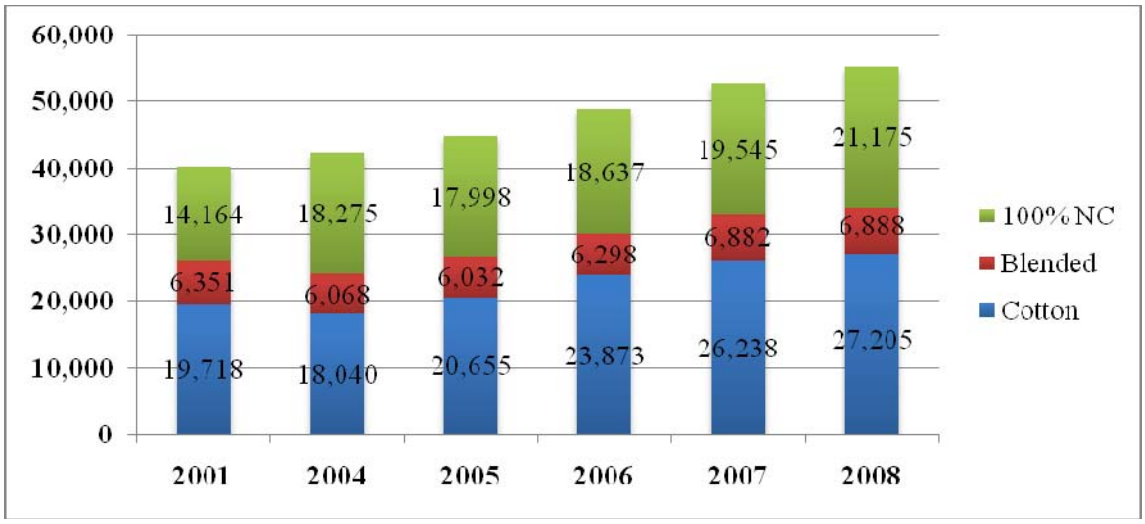
Figure 7: Share in Man-made fibre production



Source: Ministry of Textiles, IMaCS Analysis

Fabric

Figure 8: Fabric Production (in Million sq. metres)

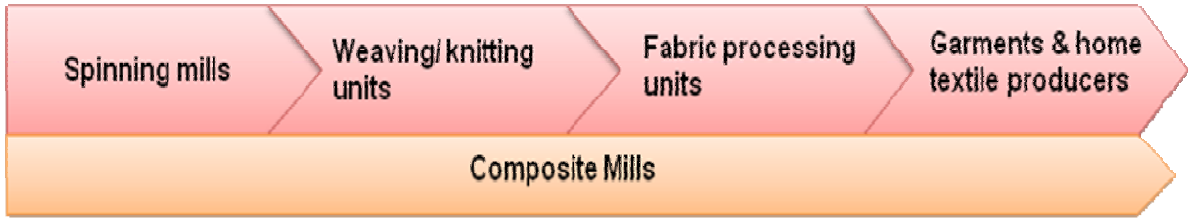


Source: Ministry of Textiles, IMaCS Analysis

India's fabric production has increased at a 5-year CAGR of 5.9% to 56,031 million square metres (msm) in 2007-08.Approximately 62% of India's fabric production comprises of cotton or cotton blends, with their share increasing during FY2005-08, primarily because of higher cotton availability.

1.4.Market Structure

Figure 9: Market structure linked up with value chain



The Indian textile sector comprises the declining vertically-integrated, large-scale composite mill segment; a fast expanding decentralised small-scale manufacturing segment, and the power loom sectors.

The role of the organised sector in fabric production has diminished over the years with its contribution dropping from 70% in the 1950s to 3-4% at present. This has mainly been on account of policy restrictions relating to labour laws and the fiscal advantages enjoyed by the small-scale and power loom sectors.

Composite Mills

Composite Mills are integrated large-scale mills that integrate spinning, weaving and, sometimes, fabric finishing. The state-wise spread of composite mills is illustrated below.

Table 1: State-wise number of composite mills

State	No. Of Composite Mills
Gujarat	44
Maharashtra	43
Tamil Nadu (TN)	25
Madhya Pradesh (MP)	11
Uttar Pradesh (UP)	10
Rajasthan	9
West Bengal (WB)	8
Karnataka	7
Others	19

Source: Ministry of Textiles, IMaCS Analysis

Around 176 composite mills were operating at end-March 2008, with an installed capacity of 5.63 million spindles. Between 1995 and 2008, the weaving capacity of the composite mills has declined from 111,540 looms to 55,480 looms.

MMF/MMFY producers

The industry structure for most man-made fibres is concentrated, with a small number of players having a large share of capacity and production. The Indian MMF industry consists of two main sets of players: erstwhile textile players, and MMF producers (that is, non-diversified players).

As of March 2008, there were 106 units in operation, comprising 32 in MMF/staple fibres, and 74 in MMFY. The installed capacity was 1.66 mtpa in MMF, and 2.10 mtpa in MMFY. In all synthetic fibres, the plant capacities of Indian players (except RIL and Indo Rama Synthetics Limited or IRSL; Grasim Industries Limited (GIL) in viscose fibres; and SRF Limited in nylon) are significantly lower than those of their international counterparts.

Spinning Mills

At end-March 2008, India had around 2,816 spinning mills including 1,219 in the small-scale industries (SSI) sector. These mills had an installed capacity of 34.41 million spindles (including 4.17 million in the SSI sector), and a workforce of 0.625 million (including 0.05 million in the SSI sector).Tamil Nadu (TN) has the highest number of spinning units and accounts for 65% of the total number of spinning units in the country.

Table 2: State-wise number of spinning mills

State	Non-SSI	SSI	Total
TN	868	976	1,844
Maharashtra	126	17	143
Haryana	66	72	138
AP	108	20	128
Punjab	79	30	109
UP	53	42	95
Gujarat	37	22	59

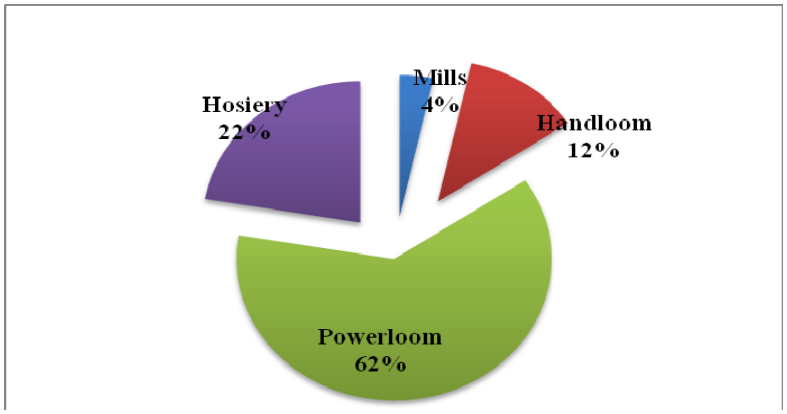
State	Non-SSI	SSI	Total
Rajasthan	47	8	55
Karnataka	47	6	53
MP	42	8	50
Kerala	30	5	35
WB	21	0	21
Himachal Pradesh (HP)	18	2	20
Orissa	16	1	17
Others	39	10	49

Source: Ministry of Textiles, IMaCS Analysis

Fabric manufacturing

India's weaving and knitting sector is highly fragmented, small-scale, and labour-intensive. This sector consists of about 38.9 lakh handlooms as well as 4,70,000 power loom units operating around 21.1 lakh power looms.

Figure 10: Contribution of sectors in total cloth production



Source: Ministry of Textiles, IMaCS Analysis

The handloom sector is labour intensive in nature and accounts for 12% of the total cloth produced in the country. This sector is highly decentralised and handloom weavers can be found in over 400 clusters in the country.

Table 3: Clusters under Integrated Handloom Cluster Development Program (IHCDS)

Cluster	State
Bargarh	Orissa
Bijoy Nagar	Assam
Bhagalpur	Bihar
Burdwan	West Bengal
Barabanki	Uttar Pradesh
Chirala	Andhra Pradesh
Chanderi/Gwalior	Madhya Pradesh
Gadag	Karnataka
Imphal	Manipur
Mubarkpur	Uttar Pradesh
Madhvaram	Andhra Pradesh
Kurinjipadi	Tamil Nadu
Nadia	West Bengal
Sone pur	Orissa
Thiruvannamalai	Tamil Nadu
Tiruchirappalli (Trichy)	Tamil Nadu
Trivandrum	Kerala
Varanasi	Uttar Pradesh
Bijnore	Uttar Pradesh
Kullu	Himachal Pradesh

Source: www.indianhandloomscluster-dchl.net, IMaCS Analysis

Power loom sector accounts for 62 % of the total fabric production in the country. Maharashtra, Tamil Nadu and Gujarat account for more than 80% of the number of installation of Power looms in India (As on 30.09.2006).

Table 4: State-wise number of power looms

States/UTs	Plain Loom	Semi Automatic Loom	Automatic Loom	Shuttle less Loom	Total
Maharashtra	833,722	35,200	13,000	4,034	885,956
Tamil Nadu	332,211	33,200	2,540	6,900	374,851
Gujarat	73,715	235,070	5,532	8,350	322,667
Madhya Pradesh	89,375	60	950	150	90,535
Karnataka	79,919	1,298	0	652	81,869
Uttar Pradesh	62,972	1,638	774	588	65,972
Andhra Pradesh	42,277	65	923	694	43,959
Rajasthan	22,965	1,800	3,228	7,801	35,794
Punjab	20,320	1,500	700	1,100	23,620
Haryana	6,224	2,083	0	1,609	9,916
Others	18,529	640	766	321	20,256

Source: Ministry of Textiles, IMaCS analysis

Fabric Finishing Units

Fabric Finishing Units include dyeing, printing, and other cloth preparation prior to the manufacture. This sub-segment is also dominated by a large number of independent, small-scale enterprises.

These units can be broadly divided into following three segments:-

- Processing facilities attached to composite textile mills (Hi-Tech Segment)
- Non-SSI independent power processing units (Medium to Advanced Technology)
- Small scale processing units (Hand operated / motor operated primitive technology locally fabricated / power operated low technology machines)

The census of the power processing units by the Textiles Committee during the year 2005 has revealed that there were 2,510 power processing units in the country compared to 2,324 units in 1999-2000.Out of

the 2,510 power processing units, 59 units are composite, 167 semi-composite and 2,284 the independent processing units.

The major clusters of processing units are Mumbai, Surat, Ahmadabad, Delhi, Ludhiana, Amritsar and Tirupur.

Clothing/Garmenting units

The clothing sector is the final stage of the textile value chain and the maximum value addition takes place at this stage. Apparel and clothing industry is fragmented and pre-dominantly in the small-scale sector excluding tailoring units, there are around 13,000 units of which 12,000 are SSI units. Most apparel manufacturers (80%) have small operations (with <20 sewing machines) while 99% of them are proprietorship/partnership concerns.

The clothing industry is fragmented and pre-dominantly in the small-scale sector. The reason for this could be attributed to the SSI reservation policy which was in vogue till 2001 for woven apparels and up to March 2005 for knitwear. The quota policy which prevailed during the quota regime also did not encourage consolidation of the units.

The apparel industry is concentrated primarily in 8 clusters, i.e., Tirupur, Ludhiana, Bangalore, National Capital Region or NCR (Delhi/Noida/Gurgaon), Mumbai, Kolkata, Jaipur, and Indore. While Tirupur, Ludhiana and Kolkata are major centres for knitwear; Bangalore, NCR, Mumbai, Jaipur, and Indore are major centres for woven garments.

1.5. Policy/Regulatory environment

- **Minimum Support Price, Export incentives to cotton**

  Minimum Support Price (MSP) for cotton was increased from Rs 2,055 per quintal in CY2007-08 to Rs 2,850 per quintal in CY2008-09 which resulted in strengthening of cotton prices. The hike in MSP resulted in artificial shortage of cotton in domestic market with procurement by CCI (up to January 20th of CY2008-09) going up by 6 times (Y-O-Y), of which 99% has been procured under MSP.

  On 17th February 2009, Central Government introduced 5% export incentive for raw cotton through the *'Vishesh Krishi aur Gramodyog Yojana'*. Majority of raw cotton from India is exported to China, Bangladesh and Pakistan who are the key competitors to Indian T&C industry.

- **Duty Structure for Man-made fibres/filaments**

  Despite a strong base in man-made fibre production, man-made fibres constituted only 36% of India's total fibre consumption in 2007 as against 62% in world fibre consumption. Anomaly in duty structure of man-made fibres is partly responsible for the existing price differential between cotton and polyester.

- **Technology Upgradation Fund Scheme (TUFS)**

  Over the last few years, Indian T&C industry had witnessed debt-funded capacity expansion, primarily driven by interest subsidy under TUFS. Though TUFS has supported modernisation and expansion in the T&C industry, delay in disbursement of TUFS has been a major deterrent. During 2007-08, Rs 8,058 crore was sanctioned under TUFS however; only Rs 6,854 crore was disbursed resulting in a backlog of Rs 1,204 crore.

- **Labour laws**

  T&C industry comes under the purview of Contract Labour Act, 1970 which prohibits contract labour for the work that is perennial in nature.

  In addition, The Factories Act, 1948 poses restriction on the maximum working hours which restricts the ability of units to meet peak season demand. Moreover, units employing over 100 people currently fall under the purview of the Industrial Disputes Act, 1947 (IDA, 1947). This creates unfair discrimination amongst large companies and the smaller ones and thus, is partly responsible for lack of economies of scale and poor competitiveness of Indian T&C industry.

- **Scheme for Integrated Textile Parks**

  The Scheme for Integrated Textile Parks (SITP) was launched by merging two schemes, namely, Apparel Parks for Exports Scheme (APES) and the Textiles Centre Infrastructure Development Scheme (TCIDS).The Government has decided to continue the scheme for Integrated Textiles Parks (SITP) in the 11th Five year Plan, taking into consideration, the response to the scheme and the opportunities for the growth of textile industry in the quota free regime.

1.6. Demand Drivers

- **Growth in PFCE on textiles**

  Demographic, Economic and Social factors such as high disposable incomes, more number of working women, young demography, etc. have contributed to the rise in PFCE on clothing. The PFCE on clothing stood at Rs 99,565 crore and had grown with a CAGR of 6.8 % over the last 5 years.

- **Increasing share in international trade**

  Traditionally, India's share of the total world T&C exports had been small till around 1980, after which it began to grow significantly, reaching a figure of around 3.5% during 2007.This is mainly on account of the trend of developed nations increasingly sourcing finished apparel from the developing world, which has the advantage of lower labour costs.

  A planned free-trade agreement between the European Union and India would have strong consequences for textile and clothing sectors.

1.7. Key Success Factors and Risk Factors

Key Success Factors

The key risk factors influencing the T&C industry are:

- Increasing productivity by leveraging technology
- Investing in IT
- Investing in brand building
- Focussing on international markets other than EU and US
- Focussing on innovations
- Achieving scale.

The share of shuttle-less looms in the Indian textiles industry is only 2-3% as against a world average of 16.9%, thereby indicating a low degree of modernisation in the Indian weaving industry. Although the Indian spinning sector is relatively more modernised, around 60% of installed spindles are more than 10 years old and open-end (OE) rotors account for only 1% of total installed spindles. In the apparel sector, India has much lower investment in special purpose machines, which perform specific functions and add

value to the product. Very few export establishments have invested in cutting machines or finishing machines

Apart from the spinning sector, textile industry is dominated by unorganised industry on account of the policy environment in the country. The industry players should look to increase their scale to be more cost competitiveness.

Key Risk Factors

- **Dependency on EU and US**

  The industry has significant dependence on exports with EU27 being the largest export market, accounting for 33% of the total T&C exports by value in 2007-08.

  US is the second largest export market for Indian T&C industry, accounting for 21% of India's total T&C exports by value in 2007-08. The country is the largest export market for Indian made-ups (accounting for 43% of India's total made-ups export value) and the second largest export market for garments (accounting for 28% of India's total garment export value).

- **Raw material (Fibre) prices**

  Failure of cotton crop and government policy in terms of minimum support prices and export incentives for cotton can push up the cotton prices. The Man Made filaments/fibres are crude derivatives and move in line with crude oil prices.

- **Exchange rate fluctuations**

  Strengthening of Rupee against international currencies would affect the cost competitiveness in the international market.

- **Protectionist measures**

  Countries are increasingly protecting their domestic industries from surging imports. After Turkey and Egypt in the last year, Peru is now planning to impose a safeguard on cotton yarn imports. Brazil has imposed anti-dumping duties on viscose yarn imports from Asia.

- **Subsidies/government support in competing countries**

  Chinese government has raised the export rebate rate for textiles and apparels thrice, from 11% at the beginning of 2008, to 15% by February 2009, the highest level in 10 years.

Vietnamese government has agreed to provide support to the country's T&C industry at a ratio of 40 Vietnamese dong per dollar in exports value i.e. exports valued at US $ 1 million would be given a support of VND 40 million from the government. 15% cash subsidy of the fabric cost is given to exporters in Bangladesh who source fabric locally.

- **Economic Slowdown**

  The continuation of the economic slowdown poses risks both in the domestic and international markets.

1.8. Drivers of competitiveness

Table 5: Drivers of competitiveness

Sources of Competitive advantages	Spinning mills	Fabric manufacturing units	Processing units	Garmenting units
Strong and diverse raw material base	✓	✓	✓	✓
Low wage rates	✓	✓	✓	✓
Economies of Scale	✓	✗	✗	✗
Level of Technology	✓	✗	✗	✗

✓ *Indicates the presence of the source of competitive advantage*

✗ *Indicates absence of the source of competitive advantage*

2. Human Resource and Skill Requirements in the Textile Industry

2.1. Current employment pattern

An estimated 33 million people are employed in the Textile sector in India[3]. This is expected to increase to 45 million by 2012. The Ready Made Garments (RMG) sector, which accounted for 17% of the employment, is estimated to contribute 25% to the total employment in the textile sector.

Table 6: Employment in different textile sectors

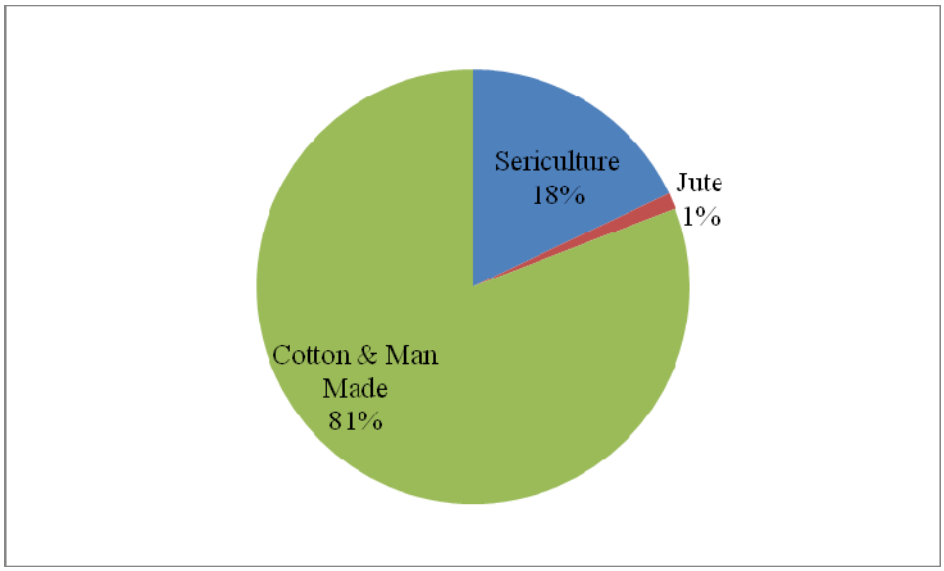
S. No.	Sector	Employment (In million)
1	Cotton/Man-made Fibre/Yarn Textile/Mill Sector (including SSI spinning & exclusive weaving units)	0.94
2	Man-made Fibre/Filament Yarn Industry (including texturising industry)	0.16
3	Decentralised Power looms Sector	4.86
4	Handloom Sector	6.5
5	Knitting Sector	0.43
6	Processing Sector	0.29
7	Woolen Sector	1.5
8	Ready Made Garment Sector (including Knitwear Sector)	5.57
9	Sericulture	5.95
10	Handicraft Sector	6.57
11	Jute Industry	
	i) Organised Jute Industry	0.26
	ii) Decentralised Jute Industry	0.14
	Total	**33.17**

Source: Planning Commission, IMaCS Analysis

Cotton and man-made textiles account for more than 80% of the employment in the textile sector, as depicted in the following figure.

[3] About 6.6 million of these are involved in the handicrafts sector which would be covered separately under the report on the unorganised sector.

Figure 11: Share in Employment of different sectors



Source: 11th Five Year Plan, IMaCS Analysis

Fabric manufacturing and garmenting accounts for a major portion of the employment in the textile sector on account the labour intensive nature of operations. The share of employment in different activities in the value chain is depicted below. The employment in fabric manufacturing includes the handloom, weaving and knitting sectors.

2.1.1. Share of Women in Employment

It is estimated that out of the total number of persons employed in Handlooms, Handicrafts, and Sericulture, about 50% are women. There are more women in the household industry than in the registered small scale or cottage units. However, in the organised sector the percentage of women workers is extremely low, with the exception being garmenting.

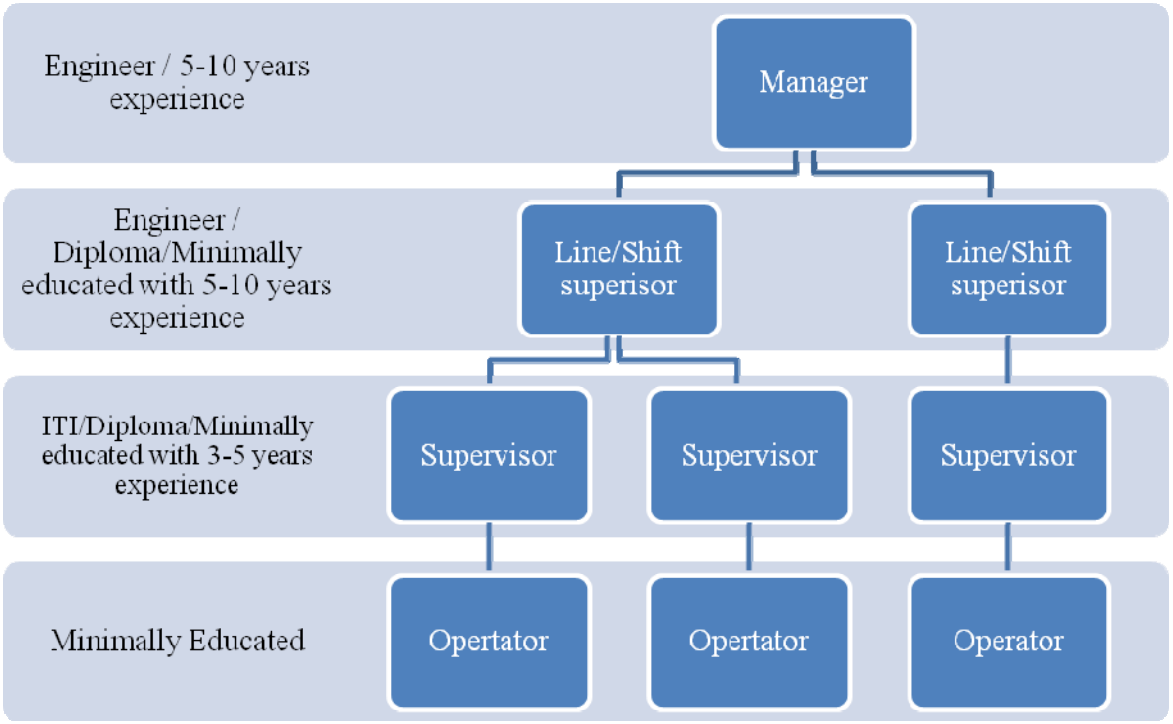
The Government has taken the following initiatives:

- The project for the establishment of a Seri-Technology Complex for Women commenced in February 2004 for a period of 5 years.
- The Government is implementing the Scheme for helping the NGOs & Women Self Help Groups for developing Jute Development Parks (JDPs) with the objective to create domestic demand for jute.

2.2. Profile of human resource employed in the T&C industry

The typical profile of people employed in production function, which is the dominant activity in the textile industry, is shown in the following figure.

Figure 12: Profile of people employed



2.2.1. Profile of human resource in different functions

The textile industry (except the spinning sector) is fragmented in nature on account of policy restrictions relating to labour laws and the fiscal advantages enjoyed by the small-scale units. The textile units mostly engage in job work (sub contracting) and hence a large portion of the employment is in the production activities. Also, the small units do not have explicit demarcation of functions for sourcing, sales, etc.

Table 7: Functional distribution of human resource across key sectors

	Procurement	Production	Sales	Quality	Engineering/ Maintenance	Support functions
Spinning Units	1%-2%	75%-80%	2%-3%	4%-5%	4%-5%	10%-12%
Fabric Manufacturing units	1%-2%	80% -85 %	1%-2%	1%-2%	1%-2%	10%-12%
Processing units	1%-2%	75%-80%	1%-2%	2%-3%	4%-5%	10%-12%
	Design	**Production**	**Merchandising /Sales**	**Quality**	**Engineering/ Maintenance**	**Support functions**
Garmenting units	1%-2%	75%-80%	3%-4%	3%-4%	3%-4%	10%-12%

Source: Industry inputs, IMaCS analysis

As seen in the above table, majority of the workforce is involved in the manufacturing/production activities.

2.2.2. Profile of human resource across various educational qualifications

The distribution of human resource by education levels is shown in the following table. Most of the human resource is minimally educated.

Table 8: Distribution of human resource by education level

Sub-segment	Engineers	Diploma or equivalent certification by other agencies	ITI and other vocational courses/Certificates	Other graduates	CA/MBA/etc.	12th/10th standard/Minimally Educated
Spinning Units	5%-7%	8%-10%	10%-12%	2%-3%	1%-2%	70%-80%
Fabric Manufacturing units	3%-5%		8%-10%	2%-3%		85%-90%
Processing units						
Garmenting units						

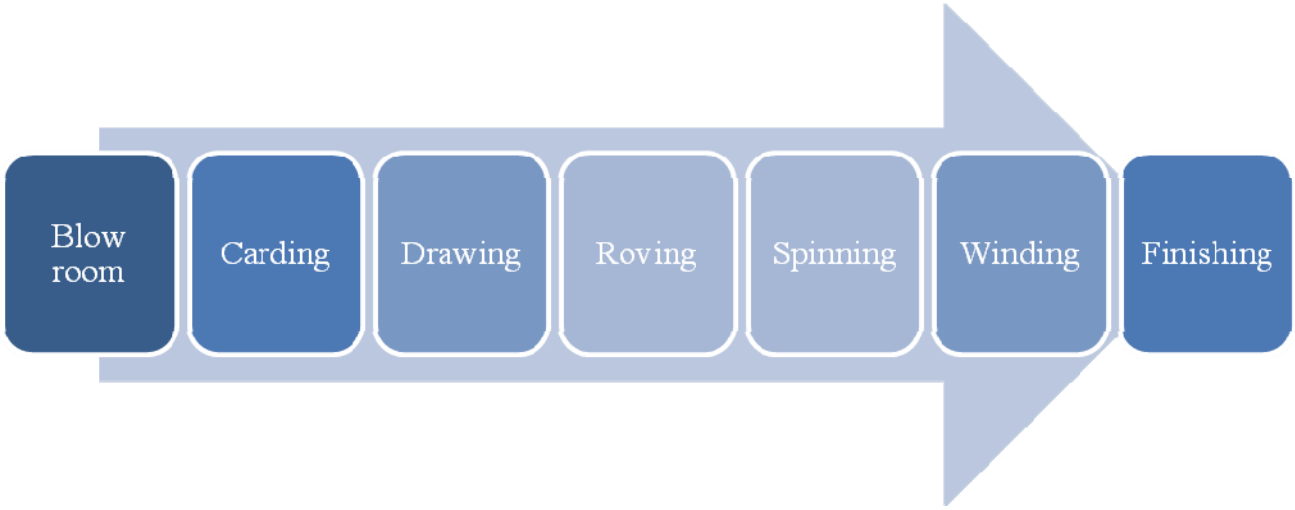
Source: Industry inputs, IMaCS analysis

2.3. Skill requirements and skill gaps in Spinning

2.3.1. Production processes involved in spinning

Common industrial spinning techniques include ring spinning, open-end (rotor) spinning, and air-jet spinning. The process description of a typical ring spinning process is depicted below.

Figure 13: Production processes in spinning



- Blow room operations: The blow room machinery performs the function of opening pressed bales of cotton and cleaning the cotton of impurities. Trash and foreign matter is extracted from the cotton with the least amount of lint loss. Blow room line consists of opening, cleaning, mixing and lap making machine. In order to produce uniform quality of yarn and also to reduce the cotton cost of yarn while achieving the desired level quality, mixing of two or more types of cotton is carried out in the blow room. The loose cotton passed through the blow room machinery is converted into regular sheets called laps.
- Carding: The material received from Blow room is processed on the Carding machines which produces a thin sheet of uniform thickness that is then condensed to form a thick, continuous, untwisted strand called sliver. This process also removes the remaining impurities from the cotton.
- Drawing: The fibers in the carded sliver are placed in a haphazard fashion and lack uniformity. The carded slivers are processed on the drawing frame, they are made uniform in thickness by the doubling process. The fibers get drawn parallel to the axis of the sliver by the drafting process.

- Roving: Slivers are to be thinned out to the level required for the yarn to be spun. This process of attenuating the slivers is done in several steps on Speed Frames. While converting slivers into roving, a small amount of twist is also inserted so that the roving can withstand the winding and the unwinding operations.
- Spinning: The roving bobbins are taken to the ring frames where it is drafted (extended) to the extent of desired level (i.e. count). The spindle along with the ring traveller mounted on a ring imparts the requisite amount of twist into the yarn. The yarn is wound on bobbins and taken to post spinning operations.
- Winding: The yarn is wound over paper cones to make final packages after passing through electronic yarn cleaners for removal of any defects. The ends are 'spliced' to produce knot-less yarns
- Finishing: Further operations on the yarn, such as Bleaching, Dyeing, and Packaging will depend on the intended usage of the yarn.

2.3.2. Skill requirements and skill gaps

The skill requirements and skill gaps in the Spinning sector are detailed below.

Table 9: Skill requirements and skills gaps in Spinning

Function	Level	Skill Required	Skill Gaps
Procurement	Purchase Manager	▪ Knowledge of various types of cotton in terms of pile length and suitability for the desired type of yarns. ▪ Knowledge of various types of cotton defects. For e.g., cotton crop which is affected by rain during harvest will be dull in colour as well as it might have black dots which will	▪ Lack of adequate knowledge to source from international destinations - Awareness of the latest price trends and sourcing destinations is limited to the domestic market ▪ In-depth knowledge of the various types of cotton and quality parameters.

Function	Level	Skill Required	Skill Gaps
		affect the quality of the yarn. The quality of cotton will impact the quality of the entire downstream products. ▪ Awareness of the latest trends in the market and ability to anticipate their impact on procurement. For e.g., an expected lower production of cotton production would imply higher prices and hence the need to stock up the raw material inventory. ▪ Negotiation and communication skills for negotiating with cotton traders. Although, cotton is mostly sourced from the domestic market, knowledge of English is desirable.	
	Purchase associate/executive	▪ Ability to calculate the amount of cotton required based on the desired "count" (quality) of the final yarn. ▪ Knowledge of various types of cotton defects and	▪ Insufficient knowledge of various types of cotton defects and other quality parameters.

Function	Level	Skill Required	Skill Gaps
		other quality parameters. ▪ Liaison with the cotton traders to ensure timely delivery of cotton.	
Maintenance	Maintenance Manager	▪ Knowledge of maintenance requirements of various textile machines. Example - Ability to maintain various machines i.e. Carding machines, Draw frames, Speed frames, Ring frames, Auto coners used in a spinning unit. ▪ Ensure availability of the spare parts and knowledge of current machine tools. ▪ Communication skills to liaison with machinery manufacturers to understand the maintenance requirements of various machines. ▪ Plan & supervise maintenance of machines to ensure minimal machine downtime. This is crucial for spinning units which are very technology intensive.	▪ Awareness of maintenance requirements of various machines is limited. ▪ Inadequate knowledge of current machinery.

Function	Level	Skill Required	Skill Gaps
	Maintenance operators	▪ Ability to carry out routine maintenance operations such as greasing. ▪ Ensure that minor issues are taken care of in a prompt manner and escalate major issues.	▪ Fitters (Maintenance operator) from ITIs have limited knowledge of maintenance of spinning machinery. The ITIs do not provide training specific to the textile machines which leads to the skill gap.
Production	Production Manager/ Shift In charge	▪ Ability to oversee plant operations ▪ Problem solving skills, good communication skills to manage shop floor workers who are mostly minimally educated. ▪ Technical competence- Very strong understanding of all aspects of the spinning process. Technical knowledge is a must as spinning sector is technology intensive in nature. ▪ Process improvement skills - waste control, finding solutions to maintenance and engineering related problems as most of the units do not have a	▪ Inadequate cross-functional knowledge especially of maintenance. ▪ Inadequate practical knowledge of tools ▪ Insufficient soft skills to manage shop floor people. ▪ Awareness of modern production methods and machines is limited

Function	Level	Skill Required	Skill Gaps
		dedicated R&D for process improvement. Yarns are a commodity product which leads to thin margins for the producers. Cost reduction through above mentioned measures is a must to improve profitability.	
	Supervisor	▪ In-depth knowledge of production process. Knowledge about the various spinning machines used across the shop floor. ▪ Man-management skills to manage shop floor workers who are mostly minimally educated. ▪ Ability to train operators to man the spinning machines. ▪ Awareness of quality requirements of the yarn across various stages of production. ▪ Monitor cleaning and maintenance schedule of the spinning machinery.	▪ Lack of man-management skills to manage shop floor personnel. ▪ The supervisors typically have work experience in particular processes of the spinning mill as operator and do not have a formal training/education of other processes. ▪ Awareness of modern spinning machines is limited.

Function	Level	Skill Required	Skill Gaps
	Operator	▪ Operating knowledge of the spinning machines. ▪ Ability to ensure that machine stoppage time in minimal ▪ Monitor spinning operation as regards the availability of sliver/bundles/lap as input to respective stages of the spindling operation ▪ Should be able to read gauges, dials, or other indicators to make sure a machine is working properly. ▪ Ability to work on different machines. For e.g. a spinning operator should be able to work on carding, roving and spinning machines. ▪ Discipline at shop floor, punctuality and regular attendance at workplace. ▪ Adherence to cleaning and machine maintenance schedule. Understanding of support to be provided for maintenance of various textile machines ▪ Ability to comply with	▪ Knowledge/ Skill confined to single or few machines ▪ Lack of knowledge of compliance to quality ▪ Inadequate ability to multi-task between different types of machines.

Function	Level	Skill Required	Skill Gaps
		quality norms.	
Quality	Quality Control Supervisor/Manager	▪ Understand the quality requirements of the yarn in terms of "count", breakage during weaving etc. ▪ Understanding of the quality parameters across the various stages of assembly line. ▪ Knowledge of the cause of various defects. For example, the Supervisory should know that a particular defect (like black dots) in the yarn is due to improper quality of cotton or particular manufacturing process.	▪ Inadequate ability to translate buyer requirements to quality parameters ▪ Lack of knowledge of cause-effect relationships for various defects (such as breakage of threads).
	Quality Control executive	▪ Understanding of the quality parameters. ▪ Ensure that the quality parameters are adhered to by diligently checking the product. For e.g. Yarn marked as count 40 should not be 38/39 which will significantly affect the fabric manufacturers. ▪ Act promptly and liaison	▪ Inadequate understanding of quality parameters.

Function	Level	Skill Required	Skill Gaps
		with production to minimise the quality issues.	
Sales	Sales Manager	▪ Detailed product knowledge in terms of type of fibre and other technical parameters. ▪ Good negotiation skills are a must as the yarn market is very cost sensitive. Minor quality issues tend to result in high discounts. ▪ Good communication skills to interact with the team as well as with the important clients. Knowledge of English is important in case of international clients.	▪ Negotiation and communication skills. Also, South-based spinning mills require people with knowledge of Hindi which are difficult to find.
	Sales Executives	▪ Awareness of competitor actions and provide feedback to the management. ▪ Understanding of customer requirements in terms of quality of yarn. ▪ Good communication skills to interact with the	▪ Negotiation and communication skills. Also, South-based spinning mills require people with knowledge of Hindi which are difficult to find.

Function	Level	Skill Required	Skill Gaps
		team as well as with the important clients.	

2.4.Skill requirements and skill gaps in Fabric Manufacturing

2.4.1. Production processes involved in weaving

Weaving is an interlacement of warp (vertical) and weft yarn (horizontal). The process of weaving of cloth is carried out in three stages.

Figure 14: Production processes in weaving

Warp Preparation

Warping is the first process of assembling individual ends into a sheet. The yarn to be warped from cones is placed in an orderly manner on a frame called creel with tensioning and stop motion devices so as to ensure proper unwinding of yarn with uniform tension from packages placed on the creel. The yarn drawn from the creel is then passed through set of lease rods and dents of wires to ensure all the warp yarn are parallel to each other of uniform tension and do not have cross ends and then wound on to a beam. The process is called warping and the machine used is “warper”. The number of threads per beam and length of the warp beam depends on the density of ends required per inch and dimensions of the fabric to be woven. Proper preparation of warp is very important for reducing breakages on loom and to achieve higher weaving efficiency. Sizing i.e. application of starch and other sizing ingredients, is done to protect the warp against breakage

Weft preparation

The weft yarn required for shuttle loom is to be wound on pirns using a winding machine called pirn-winding machine. The pirn winding is carried out either on circular pirn winding machine (for ordinary looms) and on parallel prin winders for semi auto and auto looms. The pirn winding process is eliminated in case of shuttleless looms.

Weaving

The weft and warp yarns are woven on looms. The basic operations of a loom include

- Shedding - Dividing the warp into two sheets
- Picking - Insertion of weft into the space created by the division of warp sheets
- Beating - Pulling the inserted wefts one after the other to form cloth.

The looms are broadly divided into two groups.

- Handlooms
- Power looms
    - Shuttle looms- Plain loom, Semi Automatic and Automatic looms
    - Shuttleless looms- which use Projectile Weaving Machines, Rapier looms, Water-jet Weaving Machines

2.4.2. Skill requirements and skill gaps

Table 10: Skill requirements and skills gaps in Fabric manufacturing

Function	Level	Skills Required	Skill Gaps
	Purchase Manager	▪ Knowledge of various types of yarn in terms of count, etc. and suitability for the desired type of fabric. ▪ Knowledge of various types of yarn defects. Ensure that the yarn is of the desired parameter. For e.g. even a small variation in the actual	▪ In-depth knowledge of the various types of yarn and quality parameters. ▪ Negotiation and communication skills.

Function	Level	Skills Required	Skill Gaps
Procurement		count of the yarn would lead to shortage of raw material and increased costs. ▪ Awareness of the latest trends in the market and ability to anticipate their impact on procurement. For e.g. an expected lower production of cotton production would imply higher prices of yarn as well and hence the need to stock up the raw material inventory. ▪ Negotiation and communication skills for negotiating with the yarn manufacturers. Typically the yarn manufacturers are bigger units vis-a-vis the fabric manufacturers which limits their bargaining power.	
Maintenance	Maintenance	▪ Majority of the fabric manufacturers are small units and they opt for second hand machinery. The maintenance requirement in such cases is higher compared to units with new	▪ Awareness of maintenance requirements of various machines is limited. Knowledge of maintenance of shuttleless looms is inadequate.

Function	Level	Skills Required	Skill Gaps
	Manager	machines. ▪ Ability to maintain various type of looms i.e. simple looms, automatic looms and shuttleless looms - projectile weaving machines, rapier looms and water jet weaving machines. ▪ Ensure availability of the spare parts. ▪ Ability to undertake Maintenance Planning so as to plan and supervise maintenance of machines to ensure minimal machine downtime. This is crucial for fabric manufacturing units which are very technology intensive.	▪ Inadequate knowledge of maintenance of latest machines which are imported.
	Maintenance operators	▪ Knowledge of maintenance requirements of the weaving machines. ▪ Ability to ensure minimal machine downtime. ▪ Ensure that minor issues are taken care of in a prompt manner and escalate major issues.	▪ Awareness of maintenance requirements of various machines is limited. ▪ Knowledge of maintenance of shuttleless looms is missing.

Function	Level	Skills Required	Skill Gaps
Production	Production Manager/ Shift In charge /Supervisor	▪ In-depth knowledge of production process. ▪ Awareness of quality requirements of the fabric across various stages of production. ▪ Man-management skills to manage shop floor workers who are mostly minimally educated. ▪ Ability to impart basic training to the operators. ▪ Monitor cleaning and maintenance schedule of the looms.	▪ Lack of man-management skills to manage shop floor people. ▪ Inadequate knowledge of modern looms - The supervisors typically have work experience in particular type of looms as operator and do not have a formal training/education for modern looms. ▪ Awareness of modern shuttle less looms is limited.
	Operator	▪ Operating knowledge of relevant type of looms. ▪ Examine looms to determine causes of loom stoppage, such as warp filling, harness breaks, or mechanical defects. ▪ Observe woven cloth to detect weaving defects. ▪ Discipline at shop floor, punctuality and regular attendance at workplace. ▪ Adherence to cleaning and machine maintenance schedule. - Understanding of	▪ Insufficient knowledge of looms especially shuttle less type of looms. ▪ Inadequate ability to multi-task between different types of machines.

Function	Level	Skills Required	Skill Gaps
		support to be provided for maintenance of various textile machines.	

2.5. Skill requirements and skill gaps in Fabric processing

2.5.1. Production processes involved in fabric processing

The various activities involved in fabric processing are shown in the following figure.

Figure 15: Production processes in fabric processing

- Preparatory

  Preparatory processes include the following:

  - Shearing: Removal of loose and broken threads. These loose threads give a shabby look to the fabric and interfere in the process of dyeing/printing of the fabric. The fabric is passed through shearing/cropping machine consisting of a set of spiral blades whereby such loose threads are cut and separated.
  - Singeing: Removal of threads/protruding from the surface by application of heat.
  - Desizing: Removal of the sizing agents added during fabric manufacturing. The sizing agents are hydrophobic in nature and hence interfere in dyeing/printing.
  - Scouring: The fabric is treated in alkaline conditions at boiling temperature and/or under pressure whereby saponification and emulsification makes such fats/waxes are removed from the fabric.
  - Bleaching: Bleaching agents are used to improve the whiteness of the fabric.

- Dyeing

The dyeing process can take place at different stages of the fabric development. However, dyeing of fabric, is the most common dyeing method. Dyeing is performed in continuous or batch modes. In the continuous dyeing process, the fabric is passed through a dye bath of sufficient length. The dye is fixed to the fabric using chemicals or steam followed by washing to remove any excess dyes and chemicals. The batch dying process is similar, though the dye application stage occurs in a dyeing machine where the textile and dye solution are brought to equilibrium. The use of chemicals and/or heat optimises the batch process. This is followed by washing. Jiggers are commonly used for batch dyeing. There are several different classes of dyes used in textile dyeing and printing operations. The most commonly used dyes are reactive and direct dyes for dyeing cotton and disperse dyes for dyeing polyester. An important property of a dyeing is its levelness i.e. same depth of colour all over the material along with good penetration of the dye.

- Printing

  Unlike dyeing, where the whole fabric is dyed, printing involves one or more colours in certain parts and in particular patterns.

- Finishing

  Finishing is performed to improve the appearance, texture or performance of a fabric. Qualities such as softness, lustre, durability and sometimes water repelling and flame resistance of fabrics are increased with finishing processes. Both chemical and physical methods are used to finish fabrics.

2.5.2. Skill requirements and skill gaps

Table 11: Skill requirements and skills gaps in Fabric processing

Function	Level	Skills Required	Skill Gaps
Production	Production Manager/ Shift In charge/	▪ Technical competence- Very strong understanding of both fabric and chemicals. ▪ Process improvement skills - waste control, finding solutions to maintenance and engineering related problems as most of the	▪ Inadequate knowledge of both textile manufacturing and chemistry in combination ▪ Inadequate of cross-functional knowledge especially knowledge of

Function	Level	Skills Required	Skill Gaps
	Supervisor	units do not have a dedicated R&D for process improvement. ▪ Need for understanding quality requirements of customers ▪ Problem solving skills, good communication skills to manage shop floor workers who are mostly minimally educated. ▪ Knowledge of vernacular language is essential to communicate with the workers.	effluent treatment processes. ▪ Insufficient soft skills to manage shop floor personnel.
	Operator	▪ Operating knowledge of bleaching and colouring, jet dyeing machines, jiggers, soft flow dyeing machines etc. ▪ Knowledge of various type of chemicals used in processing. ▪ Ability to identify and differentiate colours. ▪ Need for Certification of skills - The operators working on boilers need to have certification. ▪ Understanding of waste treatment operations	▪ Insufficient availability of personnel who can work in boiler operations. ▪ Inadequate knowledge of various machines and chemicals. ▪ Insufficient knowledge of effluent treatment processes ▪ Inadequate knowledge of CNC machines.
Testing/ Quality	Quality assurance/ Quality	▪ Understanding of the customer requirements and communicating the quality parameters to Lab assistants. Knowledge of	▪ Inadequate understanding of the buyer requirements and their relationship to quality parameters. (translation of

Function	Level	Skills Required	Skill Gaps
	control	international standards is desirable. ▪ Knowledge of in line and final quality testing procedures. ▪ Ability to understand and prevent defects such as shade variations, patches, etc. For e.g. in case of dyeing, loose threads in the fabric would impact the quality of the dyeing.	buyer requirements to quality parameters).
	Lab Assistants	▪ Knowledge of laboratory routines & practices. ▪ Maintain records of testing results, routine logs and laboratory notes, etc. ▪ Knowledge of various chemicals and dyes.	▪ Inadequate knowledge of various chemicals vis-a-vis processing of fabrics.

2.6. Skill requirements and skill gaps in Garmenting

2.6.1. Production processes involved in Garmenting

The various activities involved in garment manufacturing are shown in the following figure.

Figure 16: Production processes in garmenting

- Cutting

  The fabric is cut as per the defined pattern for different parts of the garment. Markings are made on the spread fabric which is then cut/chopped in the cutting machine. Wastage reduction is a key consideration during this step.

- Stitching

  A number of stitch and seam types, and sewing machines are used for stitching the garment. The following table gives the details of operations involved in stitching of a basic shirt.

Table 12: Operations involved in stitching a shirt

S. No.	Name of operation	Machines and tools involved
1	Hem pocket	**Lock Stitch**
2	Crease pocket	---
3	Sew front placket	**Packet Sewing**
4	Folding right front edge	**Lock Stitch**
5	Sew pocket	**Lock Stitch**
6	Attach yoke to back	**Lock Stitch**
7	Join shoulder	**Lock Stitch**

S. No.	Name of operation	Machines and tools involved
8	Attach sleeve	**O/L**
9	Top stitch on sleeve	**Lock Stitch**
10	Side seam & in seam with w/c	**F/O/A**
11	Fuse collar &band interlining	**Fusing M/C**
12	Run stitch	**Lock Stitch**
13	Trim collar & band	**Scissor**
14	Pressing	**Iron**
15	Top stitch & join	**Lock Stitch**
16	Trim upper collar	**Scissor**
17	Top stitch collar band	**Lock Stitch**
18	Trim band & notch	**Scissor**
19	Attach collar &label	**Lock Stitch**
20	Close collar	**Lock Stitch**
21	Hem cuff interlining	**Lock Stitch**
22	Run stitch cuff	**Lock Stitch**
23	Turn & press cuff	**Cuff Creaser**
24	Top stitch cuff	**Lock Stitch**
25	Attach cuff	**Lock Stitch**
26	Close cuff	**Lock Stitch**
27	Bottom hem	**Lock Stitch**
28	Sew button hole	**Button Hole m/c**
29	Sew button	**Button Stitch m/c**

Source: ATDC

Stitch classification is based on the structure of the stitch and method of interlacing. Machine in each class may have the capability of producing several different types of stitches depending on the machine structure and how it is set and threaded.

Table 13: Types of Stitches

Stitch Class	Application
100 (Chain Stitch)	Basting, Button sewing, Blind hemming, Decorative Stitch
200 (Hand Stitch)	Hand Stitch
300 (Lockstitch)	General Sewing
400(Multi chain Stitch)	Front placket of shirt, Waistband, Sleeve inseam & side seam of shirt, trouser
500(over-edge stitch)	Edge finish, Seam on Bag, Surging operation Seaming knit
600(Flat Seam Stitch)	Knits

Source: ATDC

A group of stitches with specific purpose is called seam, or in other words a line of stitches. Seams are categorised into 8 classes are designated according to the types and minimum number of components within the seam.

- Assembling

Assembling will be required for a unit which has a line system of manufacturing where different components of the fabric are stitched separately and have to be assembled to make the complete garment. Various accessories like button are also added to the garment.

- Finishing

Finishing involves the following operation:

- Removal of excess thread
- Washing
- Pressing/ Ironing
- Folding.

2.6.2. Skill requirements and skill gaps

Table 14: Skill requirements and skills gaps in Garmenting

Function	Level	Skills Required	Skill Gaps
Procurement	Purchase Manager	▪ Knowledge of various types of fabrics (type of material, count/picks, Dye requirements, etc). ▪ Knowledge of various types of fabric defects such as breakage of threads, missing threads, stains, patches and shade variation, etc. ▪ Awareness of the latest price trends in the fabric market. ▪ Negotiation and communication skills for negotiating with the fabric manufacturers.	▪ In-depth knowledge of the various types of fabric and quality parameters. ▪ Negotiation and communication skills.
	Purchase associate/ executive	▪ Ability to calculate the amount of requisite quality fabric required based on the order size and likely wastage. ▪ Knowledge of various types of fabric defects and other quality parameters. ▪ Liaison with the fabric manufacturers and fabric	▪ Insufficient knowledge of various types of fabric defects and other quality parameters.

Function	Level	Skills Required	Skill Gaps
		processors.	
Merchandising	Senior Merchandiser	▪ Understanding of various production activities as the merchandiser is interface between the buyer and the company ▪ Soft skills like negotiation and communication skills. These skills assume more significance for export oriented units. ▪ Knowledge of foreign languages such as French for better co-ordination with the buyer. ▪ Ability to handle multiple accounts/customers. ▪ Thorough understanding of costing. ▪ Understanding of buyer requirements of design and quality.	▪ Lack of soft skills for interacting with buyers in the international market. ▪ Knowledge of foreign languages is limited to English – this might prove to be an issue with India becoming a sourcing hub for garments and knitwear ▪ Understanding of various factors affecting costing.
	Junior Merchandiser/ Merchandising executive	▪ Reviewing materials used for garment manufacturing ▪ Understanding of various production activities as the person is responsible for	▪ Inadequate understanding of various production activities. The person employed picks up the requisite skills with

Function	Level	Skills Required	Skill Gaps
		execution of the order. ▪ Ability to work closely with other functions like design, production etc. ▪ Time management skills to handle multiple orders at the same time. ▪ Basic computer skills.	experience. ▪ Inadequate understanding of quality requirements.
Design	Designer	▪ Design and develop garments according to buyer requirements. ▪ Ability to modify existing designs to suit the current trends in the market. ▪ Keep abreast with the latest fashion trends in the key markets - the designer should be aware of the colours, contours which are in vogue. ▪ Knowledge of Styling, Elements of Design, Basics of Costing, Fabric Study, Pattern Making and Draping.	▪ Inadequate understanding of buyer requirements which leads to number of iterations before the sample is accepted. ▪ Insufficient knowledge of latest fashion trends in the international markets – changes in design between 'seasons'. It is required that the designer be able to forecast trends by being networked with foreign designers in major markets. The same is applicable to Indian markets as well.
	Production Manager	▪ Knowledge of pattern making ▪ Ability to undertake inspection, production planning and control	▪ Inadequate knowledge of speciality fabrics ▪ Lack of adequate scientific knowledge of line balancing, work study, and

Function	Level	Skills Required	Skill Gaps
Production		▪ Man-management skills.	Quality Control (this is because a large number of managers have been elevated by experience rather than by formal training).
	Line Supervisor/ Floor supervisor	▪ In-depth knowledge of production process and inspection methods ▪ Knowledge of different type of fabrics as well as understanding of stitching processes. ▪ Ability to guide the sewing machine operators. ▪ Man-management skills to manage the shop floor. The Supervisor should be able to motivate the workers in the challenging work atmosphere as the demand is seasonal and order driven.	▪ Insufficient knowledge of various types of sewing machines (refer table listed earlier) – ability work in a cross-functional manner across sewing machines ▪ Inadequate soft skills to manage the shop floor personnel.
	Operator	▪ Good machine control - knowledge of threading of sewing machine, stitching on different shapes, seaming garment components together in various fabrics to specified quality and quality	▪ Lack of proper knowledge of sewing machine operations, and different types of seams and stitches ▪ Ability to work across different machines is missing

Function	Level	Skills Required	Skill Gaps
		standard ▪ Knowledge of machine maintenance procedures ▪ Knowledge of Pattern Making, Grading and Draping. ▪ Knowledge of CAD for Pattern Development ▪ Ability to sew complete garment.	▪ Ability to stitch the complete garment is missing (In case of units which do not follow line system of production)
Quality	Quality control executive	▪ Quality requirements are all the more important for companies focussing on international markets. Even small quality issues can lead to cancellation of order. ▪ Understanding of the customer requirements by interacting with the merchandiser. ▪ Knowledge of international standards is desirable. ▪ Knowledge of in line and final quality testing procedures - ability to understand and prevent defects like size variations, loose threads, stains etc.	▪ Knowledge of international quality standards is a significant gap.

2.7. Current Training/Education Infrastructure

The current training infrastructure is inadequate on both number of people trained and also the quality of training being imparted. Also, very few of the training initiatives are targeted at the shop floor level. The newly inducted workers learn through informal training and learning from the experience of the existing work force.

Table 15: Training Infrastructure of Textile Sector

Training Institute	Number of centres/units
Textiles Research Associations (TRAs)	8
Powerloom Service Centres (PSCs)	44
Indian Institutes of Handloom Technology (IIHT)	4
Weaver's Service Centres (WSC)	24
Industrial Training Institutes (ITI) offering courses related to Textiles	1,243
Home Science Colleges offering Textiles & Clothing Courses	24
Apparel Training & Design Centres (ATDCs)	52
Institute of Apparel Management	1
National Institute of Fashion Technology	12*
Sardar Vallabhbai Patel Institute of Textiles Management	1

Source: Report of the Committee to assess the requirement of human resource in the Textile sector, Ministry of Textiles, ATDC, NIFT

**Does not include one international centre*

Training in these Industrial Training Institutes (ITIs) is mainly imparted in the following trades:

(1) Bleaching

(2) Dyeing

(3) Block printing

(4) Cutting and tailoring

(5) Dress making

(6) Embroidery

(7) Hand weaving of niwar tape

(8) Durries

(9) Carpet

(10) Knitting with hand operated machine

(11) Weaving of silk and woollen fabrics, etc.

The availability of trained manpower is a key issue for the garmenting sector. The ATDC, ITIs and NIFT annually train up to 50,000 workers. A few private sector players also provide training specific to the garmenting sector. A large portion of the requirement of human resource at the operator level is met by on the job training. ***Hence training at the operator level is a key gap.*** Acute shortage of skilled man power leads to poaching and acts as a detriment to spending on in house training initiatives.

2.8. Emerging trends in skill requirements

2.8.1. Emerging trends in human resource requirements

Technology

- The changes in technology would significantly affect the profile of people involved. As mentioned earlier, the share of shuttle-less looms in the Indian textiles industry is only 2-3% as against a world average of 16.9%, thereby indicating a low degree of modernisation in the Indian weaving industry. Although the Indian spinning sector is relatively more modernised, around 60% of installed spindles are more than 10 years old and open-end (OE) rotors account for only 1% of total installed spindles. In the apparel sector, India has much lower investment in special purpose machines, which perform specific functions and add value to the product. Very few export establishments have invested in cutting machines or finishing machines. The low level of technology and government incentives like TUFS would drive modernisation in the industry where as the high power costs would be a detriment.

- The technological upgradation would necessitate the human resource to be trained in modern machinery and also greater in house spending on training. The shortage of labour and increasing wage rate would further induce greater automation which will lead to higher productivity. For instance, the operating hours per quintal of yarn have decreased from 77 to 25 on account of modernisation and would continue to fall. Also, the numbers of people involved in post spinning operations have come down on account of automatic cone winding machines.
- The modern machinery would require skilled maintenance people who have the requisite knowledge of the same. Proper maintenance would be crucial as machine down time and costly spare parts would significantly affect the performance of the industry.

Quality Processes

There would be increasing focus and adoption of quality and environment related processes, such as:

- ISO 9001:2008
- ISO 14001.

Research & Development

- The textile industry does not have R&D as a focus area. The industry would have to invest more in both process and product R&D to maintain product and cost competitiveness. This requires industry-academia collaborations as well as individual R&D efforts by the companies.

Labour laws

- More flexible labour regulations will positively affect the industry. Currently, T&C industry comes under the purview of Contract Labour Act, 1970 which prohibits contract labour for the work that is perennial in nature. The exporters find it difficult to manage the seasonal and order based volatility in demand on account of this. Change in the current regulations can lead to opening up of more employment opportunities. Also, the current regulations prohibit women from being employed in night shifts. Relaxation of the same with adequate safeguards can lead to more participation of women and also help in addressing the skill shortage in the industry.

Human resource related

- Modernisation of technology would necessitate more technical skills for operators in the production and maintenance functions across the value chain of the textile industry. The sector

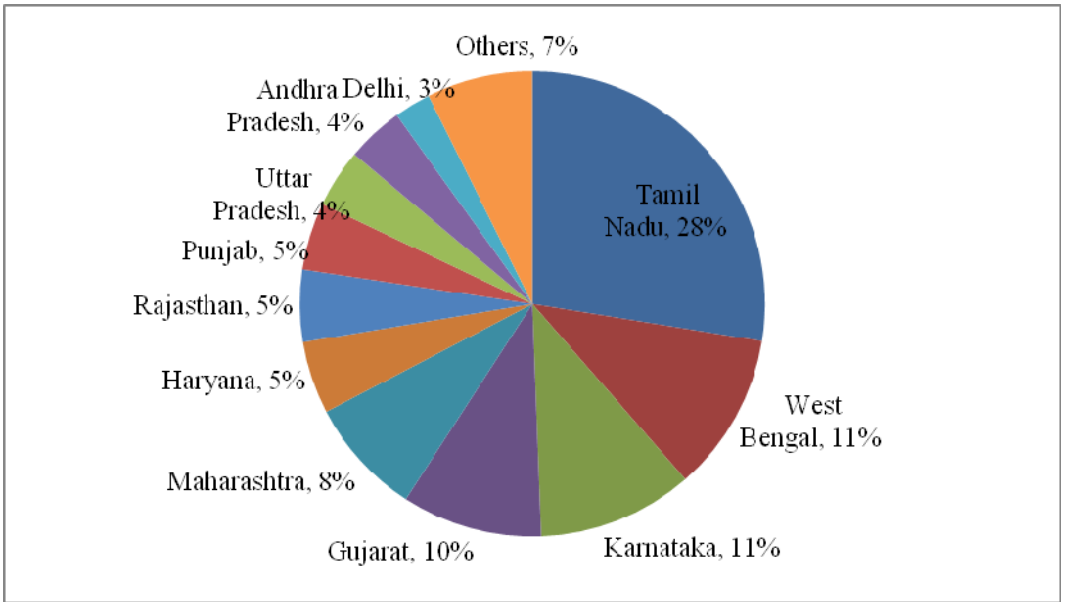
also needs ***multi-tasking/multi skilling*** at the operator level. The human resource at the higher levels as well as in other functions like procurement would need to possess the knowledge of various types of machines and also keep abreast with the changes in technology.

- The garmenting sector would be the ***key driver*** of the employment in the textile sector. majority large portion of the human resource requirement will be for operators who have the adequate knowledge of sewing machine operations and different types of seams and stitches. Although, the industry will continue to have predominantly line system of operations, designer and high end fashion exports would necessitate "make through" system of operations which would require the operators to have the ability to stitch the complete garment. The availability of merchandising and designing skills would be crucial for increasing share in export markets and tapping the potential in new markets.

2.8.2. Regions which will drive human resource requirements

The major centres in India where this employment generation would take place are Tamil Nadu, West Bengal, Karnataka, Maharashtra, and Gujarat. The state of Tamil Nadu will account for around 30% of the employment in the textile sector.

Figure 17: Share of various states of employment in the textile sector



Source: Annual Survey of Industries, IMaCS Analysis

The poor performance of the industry in the recent past has resulted in the sector not attracting new investments. The cluster development activities of various organisations have not found takers and hence new clusters do not appear likely at this point of time. However, Andhra Pradesh is a likely future destination for new investments, especially in the garmenting sector with the establishment of Apparel Parks. The government initiatives of providing power at a cost of 2 Rs per unit will be a key factor in attracting investments in spinning sector. Also, the state has surplus cotton and would result in lower logistics cost. Availability of raw materials and low power costs will also attract investments in the downstream activities like fabric manufacturing, processing and garmenting.

The scheme of integrated textile parks and various SEZs would also affect the regions availability of labour. States like Uttranchal necessitate that most of the labour force in the units operating in SEZ should be local.

The states of UP, Bihar and Orissa etc would be key catchment areas to meet the labour requirements. Already the spinning sector in Tamil Nadu is seeing more and more influx of labour from these states as the current wage rates in the states are very high.

Environmental concerns would affect the processing sector. The effluent treatment requirements might see units shifting to coastal areas as marine discharge requirements are less stringent.

2.9. Projected Human Resource Requirements in the Textile & Clothing Sector

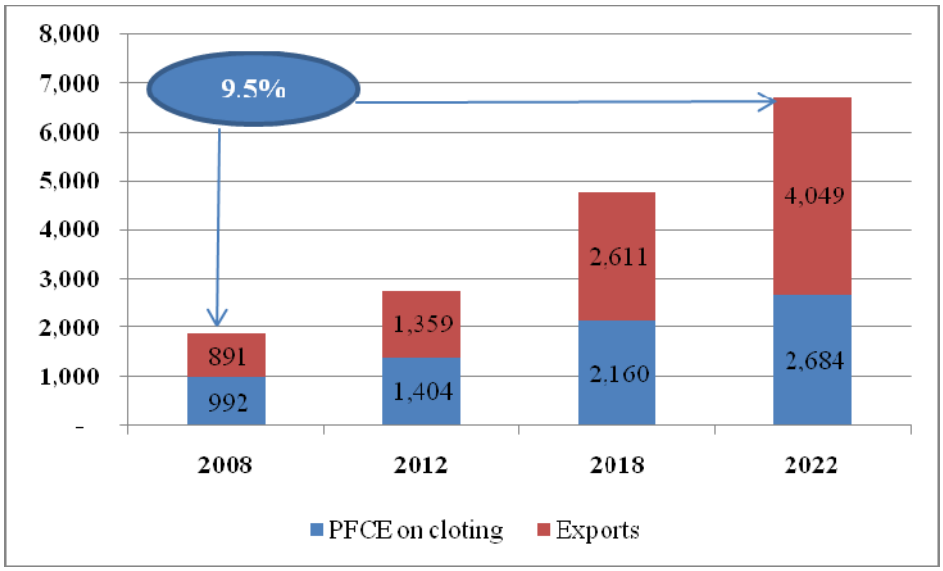
In this section, we shall review the projected human resource requirement in the Textile and Clothing sector based on the projection of industry size.

2.9.1. Projected Size of the Textile and Clothing Industry

It is estimated that the PFCE on clothing will grow at a CAGR of 7.5% between 2008 and 2022[4]. Based on projected growth of GDP and exports, we expect that the exports of textiles will grow at a rate of 11% to 11.5%. Thus, the overall T&C sector will grow at a CAGR of 9.5% to a size of Rs. 6,730 billion. Out of this, the share of exports is expected to increase from just under 50% currently to about 60% in 2022.

[4] Our overall approach to macro-economic modeling and forecasting is explained in a separate annexure

Figure 18: Projected size of the Textile and Clothing industry (in Rs. billion)



Source: IMaCS analysis

2.9.2. Projected human resource requirement

While analysing the human resource requirement, we have categorised the overall T&C sector as follows:

1. The Mainstream T&C sector – comprising of Spinning, Fabric Manufacturing, Fabric Processing, and Garmenting.
2. Other related industries such as:
    a. Handloom
    b. Woolen
    c. Sericulture
    d. Handicrafts
    e. Jute.

While we expect the human resource requirement in the Mainstream T&C sector to be closely related to market driven T&C industry growth, the human resource requirement in areas such as handloom and handicrafts would have to be supplemented by initiatives from the Government and Industry. The addition of human resource into these other sectors would be at a much lower rate as compared to the Mainstream sectors due to need for significant support for earnings, scope for enhanced technology intervention and automation as compared to current levels, the need to add value, and attractiveness of the sector among the human resource supply.

Keeping in mind the above factors and the growth of the industry, we have projected the human resource requirement for the T&C sector. It is expected that the overall employment in the sector would increase from about 33 to 35 million currently to about 60 to 62 million by 2022. This would translate to an incremental human resource requirement of about 25 million persons. Of this the Mainstream T&C sector has the potential to employ about 17 million persons incrementally till 2022.

Table 16: Projected human resource requirement in the T&C sector (in million)

	2008	2012	2018	2022	Incremental
Main-stream Textile & Clothing Industry					
Spinning	1.2	1.5	2.0	2.4	1.3
Fabric Manufacturing	5.1	6.5	9.0	11.0	5.8
Fabric Processing	0.3	0.4	0.5	0.6	0.3
Garmenting	6.5	8.6	12.6	15.8	9.3
Sub-Total	***13.1***	***16.9***	***24.1***	***29.9***	***16.8***
Other Related Sectors					
Handloom Sector	6.7	7.0	7.2	7.4	0.7
Woolen Sector	1.9	3.2	4.3	5.2	3.3
Sericulture	6.3	7.0	7.9	8.5	2.3
Handicraft Sector	7.0	8.0	9.0	9.8	2.7
Jute Industry	0.4	0.6	0.8	0.9	0.5
Sub-Total	***22.3***	***25.8***	***29.1***	***31.8***	***9.4***
Total	**35.4**	**42.6**	**53.2**	**61.6**	**26.2**

Source: IMaCS analysis

2.9.3. Profile of projected human resource requirement in the Mainstream T&C sector

Based on the distribution of human resource employed, the projected profile of human resource requirement across various education levels is presented below.

Table 17: Projected human resource requirement across various educational levels (in million)

Workforce distribution by education	Engineers, etc.	Diploma or equivalent certification by other agencies	ITI and other vocationally trained	Other graduates	CA/ MBA/ etc.	12th/10th standard and below/ dropouts	Total
Spinning	0.03	0.11	0.14	0.04	0.01	0.94	1.27
Fabric Manufacturing	0.06	0.12	0.47	0.06	0.06	5.09	5.85
Fabric Processing	0.00	0.01	0.03	0.00	0.00	0.28	0.33
Garmenting	0.09	0.19	0.75	0.09	0.09	8.13	9.34
Total	0.18	0.42	1.38	0.19	0.17	14.44	16.79

Source: IMaCS analysis

The profile of human resource across various functional levels is shown below.

Table 18: Projected human resource requirement across various functional levels (in million)

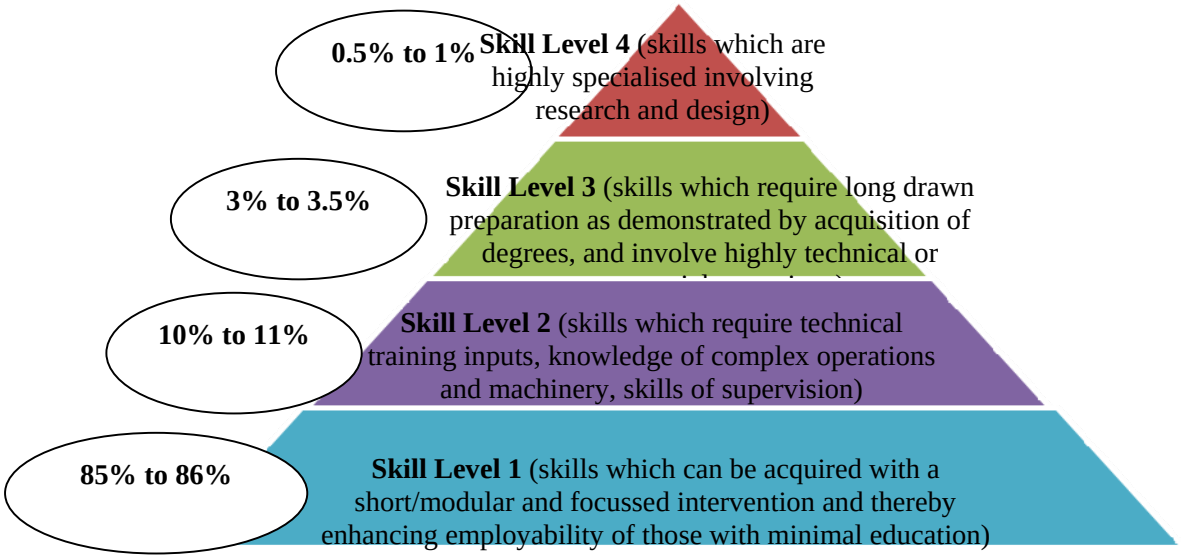
Workforce distribution by function	Procurement	Production	Sales	Quality	Engineering and Maintenance	Support	Total
Spinning	0.02	0.98	0.03	0.06	0.05	0.13	1.27
Fabric Manufacturing	0.09	4.68	0.06	0.06	0.29	0.67	5.85
Fabric Processing	0.00	0.26	0.00	0.00	0.02	0.04	0.33
Garmenting	0.09	7.48	0.37	0.37	0.28	0.75	9.34
Total	0.21	13.39	0.46	0.50	0.64	1.59	16.79

Source: IMaCS analysis

2.9.4. Skill Pyramid for the T&C industry

Given that the industry would required a varied profile of skill sets, the following figure presents an overview of the profile of skill requirements as derived from human resource requirements across different sectors of the T&C industry.

Figure 19: Skill Pyramid within the Textile and Clothing Industry



Source: Industry inputs, IMaCS analysis

The skill pyramid, in summary, captures where the T&C industry stands relatively in terms of skills (a function of activity, educational requirements, and amount of 'preparatory' time required to inculcate a specific skill) as compared to all other industries.

As can be observed, the lower portion of the pyramid, 'Skill Level 1', has the highest incremental requirement of human resources. It requires persons who are minimally educated, yet can handle simple and/or repetitive tasks (persons employed in activities such as ***basic machine operations, knitting, cutting, and stitching/sewing***, etc.). Such skills can also be obtained in lesser time duration as compared to engineering or ITI courses. As many as over *15 million* persons are required across skill levels 1 and 2 outlined above.

2.10. Focus areas for NSDC for Skill Building

As evident from the discussion above, the primary focus areas for NSDC for skill building in the T&C sector should be as follows:

- Machine Operators in Fabric Manufacturing and Processing
- Stitching and Sewing Machine Operators in Garment Manufacturing.

Based on discussions with stakeholders, we outline the following broad areas of skill building in the T&C industry where NSDC can specifically focus its energies.

Table 19: Illustrative focus areas for NSDC for Skill Building

Segment	Course type	Content areas for Skill Building
Fabric Manufacturing	Power loom Operations	▪ Operations of rapier looms, water jet looms, high speed looms, synthetic silk looms ▪ Skills of dobby loom weaving, operations of jacquard loom, loom threading, loom pattern changing ▪ Regular maintenance – preventive and schedules ▪ Quality compliance.
Garmenting	Apparel Manufacturing	▪ Pattern making ▪ Garment Construction ▪ Quality Control ▪ Time and Motion studies ▪ Production Planning and Control ▪ Computer based tools.
Garmenting	Fashion Design	▪ Fashion styling and illustration ▪ Basics of costing ▪ Pattern making and draping ▪ Merchandising ▪ Design studio activities ▪ Portfolio presentation.
Garmenting and Fabric Manufacturing	Quality Assurance	▪ Pattern making and garment construction ▪ Quality Control processes and inspection ▪ Fabric and Garment defects and remedies ▪ Technical audit and computer skills.

Segment	Course type	Content areas for Skill Building
Garmenting	Knitwear Manufacturing	▪ Pattern making for knits ▪ Quality Control ▪ Time and Motion studies ▪ Production Planning and Control ▪ Computer based tools.
Garmenting and Fabric Manufacturing	Production Supervision and Quality Control	▪ Inspection methods ▪ Quality Systems ▪ Sewing and Supervision skills.
Garmenting	Sewing Machine Technician	▪ Maintenance and operation of high speed sewing machines ▪ Chain stitch, button stitch, etc. ▪ Maintenance and precautions.
Garmenting	Sewing Machine Operators	▪ Basic sewing machine control ▪ Threading ▪ Sewing of different shapes ▪ Quality standards ▪ Maintenance of sewing machine.

Source: Industry inputs, ATDC, and IMaCS analysis

2.10.1. Key Skill Sets

The demand for key skill sets across the Mainstream sectors of the T&C industry is indicated below.

Table 20: Incremental demand for key skill sets in the Mainstream T&C industry till 2022 (in million)

Segment	Supervisors and Technicians	Operators	Total
Fabric Manufacturing	0.58	5.09	*5.67*
Fabric Processing	0.03	0.28	*0.32*
Garmenting	0.93	8.13	*9.06*
Total	**1.55**	**13.50**	**15.05**

Source: Industry inputs, ATDC, and IMaCS analysis

The above skill sets and specific focus areas outlined earlier will be the major drivers of human resource requirement in the Textile and Clothing industry in the horizon till 2022. Skill building in these areas would be key to industry competitiveness going forward. As is evident, this involves the humungous task of skilling about 15 million persons till 2022 – ***about 1 million persons per year.***

This report has been prepared by **ICRA Management Consulting Services Limited (IMaCS).**

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