INNOVATION, TECHNOLOGICAL CHANGE AND DEVELOPMENT IN THE TEXTILE CLUSTER OF PANIPAT

5.1 SUMMARY VIEW OF THE PANIPAT CLUSTER OF TEXTILES

The textiles cluster of Panipat is one of the sixty odd textile clusters in India.\(^{291}\) It is located in and around the city of Panipat, situated on national high way eight, at a distance of nearly hundred kilometers from Delhi. The cluster belongs to the Panipat district of the state of Haryana, which is one of the most advanced states of the union of India.\(^{292}\) Though not one of the most industrialized district in Haryana, Panipat is a fairly industrialized and urbanized district. The textile cluster of Panipat is not confined to the city limits, but overflows in a big way in the adjacent villages. Textiles, the dominant industrial activity in Panipat, accounts for nearly 90% of the industrial output of the district.\(^{293}\)

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\(^{291}\) The list of the textile clusters listed in the UNIDO database is provided in Appendix - II a. In addition to these sixty textile clusters located in the urban areas, there are several hundred artisanal clusters. SIDO list of clusters shows there are hundreds of clusters belong to the textile sector, spread all over the country.

\(^{292}\) In 2001, Haryana, with a per capita income of Rs. 23742 ranked second in terms of income per capita among the Indian states, being next only to the Punjab. Haryana is one of the most industrialized states of India. According to Udyog Yug, Feb 2002 It has as many as 1157 LMEs (large and medium enterprises) and 75000 SSI units. A small state, ranking 15\(^{th}\) among Indian states in terms of population size, Haryana is the biggest manufacturers of passenger cars, bicycles, GI pipes and gas stoves. It also has a considerable presence of industries in sectors like textiles, sugar, paper, cement, agricultural implements, machine tools, steel rolling and steel tubes and glass etc. In the textile sector, apart from manufacturing of cotton textiles, which takes place mostly in the SSI sector, the state also manufactures woolen textiles and hosiery items. It has as many as 78 spinning mills and two composite mills, engaged in the spinning of natural as well as man made fibers. Panipat is the biggest centre for cotton textiles in the state. Haryana is one of the biggest producers of raw cotton, next only to Maharashtra. In recent years the state has seen considerable presence of IT and automobile industry.

\(^{293}\) Till 1966 Panipat, and indeed the entire Haryana was a part of the state of Punjab. In 1966, with the state of Haryana coming into being, the cluster became a part of Karnal district in the state of Haryana. In 1989 the cluster became the part of the newly formed Panipat district, which was culled out from the Karnal district. Apart from the city of Panipat, the district also includes the town of Samalkha, known for its metal work and agricultural machinery. The district ranking 12\(^{th}\) among 21 district in Haryana in terms of population size, is one of it’s smaller districts, accounting for about 4% of the state’s population. As per 2001 census, the total population of Panipat city was 261,665 and that of Panipat district 967338. The decadal rate of growth of population of the district, at 38.57% is much higher than the decadal growth rate of the state of Haryana, which was 28.06%. Fast rate of growth of migrant population, due to fast rate of growth of textile industry may be the reason for this exceptionally high decadal rate of growth of the district’s population.\(^{293}\) The ratio of urban population to total population in the district, as per 2001 census, stands at 31.5%, as against Haryana’s 29.9%.
5.1.1 Brief History of the Cluster

Historically the city of Panipat is best known for the three battles fought in it between 1526 and 1761 A.D.\textsuperscript{294} Though the presence of a large number of historical monuments in and around the city suggests rich economic and cultural history of the city, there is not much detail...
available about its economic history during the ancient and medieval era. However there is significant evidence of a flourishing textile industry in the British era, which started in 1824, after the end of the Moghal era. The British period coincided with the period of accelerated industrial activity in the city, textiles being at the heart of this activity. According to Mr. Garg, president of All India Shoddy Wool Association, and the owner of the Swastik Spinning Mill, which is one of the earliest spinning units to start in India British government tried to consolidate the considerable weaving activity that existed in the region from the Moghal period. The city had considerable blanket weaving activity, for which most of the wool was imported from Italy. During the British period the city acquired a couple of spinning units, which spun wool for blankets. Swastik Spinning Mill, one of the oldest spinning mills in the country, was started by a diploma holder in textile technology in the British period. According to Mr. Mahajan, a third generation entrepreneur, whose forefathers came to Panipat at the time of partition, the city of Panipat also has the distinction of having one of the three finishing plants which existed in the country in the per-independence time.

Thus, the historical city of Panipat has had considerable activity in the textile sector in the Moghal as well as British period. But the date of origin of the present handloom cluster can be fixed in the decade following the partition of the country in late 1940s. The history of Panipat in a successful textile cluster is inextricably linked to the historical event of partition of India. Like some other clusters in Punjab, Panipat’s emergence and growth as a textile cluster has been critically dependent on the traditional skills and entrepreneurial capabilities of the migrant population, and the industry friendly policies of the Punjab government of that time.

At the time of partition there existed a large number of weaving units in the city of Panipat. During the partition, most of the Muslim weavers migrated to Pakistan, leaving behind their looms. At the same time Hindu weavers of the districts of Multan, Jhang and Hyderabad were fleeing from Pakistan to India. On Gandhiji’s suggestion the then chief minister of Panjab invited these weavers to settle in Panipat, the city which had weaving infrastructure in place, but

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296 Among other things, they build sheds for weavers, thus marking the beginning of factory setting of weaving activity, which was a purely cottage industry at that time. According to Mr. Mahajan, the aerial view of the city reveals the letter ‘W’, signifying the import of weaving for the city at that time.

297 Among other things, they build sheds for weavers, thus marking the beginning of factory setting for weaving activity, which was a purely cottage industry at that time. According to one interviewee the aerial view of the city reveals the letter ‘W’, signifying the import of weaving for the city at that time.

298 The other two were located in Bombay and Amritsar.

299 Other clusters include knitwear and bicycle clusters of Ludhiana. (See Tewari 1998, 1999)
had few weavers left in the city. So in a rare instance of micro level man-power planning, the weavers from Pakistan were brought to the city of Panipat and were given looms left behind by the Muslim weavers. The credit of making Panipat the city of looms goes to the talent, the tenacity and the hard work of these 150-200 migrant families, known as Hyderabadis. Originally migrant Hyderabadi families started spinning and weaving in the house-hold (HH) units. Spinning was done by the wives, while husbands took care of weaving. They modified the existing looms as per their requirements. Dyeing, carried out on the angithi with the help of most primitive technology, was the joint responsibility of the husband and the wife. On the whole, technologies used for spinning, weaving and dyeing in the cluster in the middle of the twentieth century were primitive. But there were significant technological and entrepreneurial capabilities brought in the cluster by the migrant population which soon brought Panipat on the textile map on independent India.

There were many pioneers among the first generation migrants who contributed immensely in the growth of the cluster, through their hard work, and more so through their special skills. Some of them were innovators in their own right, and were also responsible for the creation of considerable technological capabilities which the city was to acquire with in a short period.

One such pioneer was Ustad Nandlal. He came to Panipat in 1948 from Dera Ismail Khan in Pakistan, where he was associated with weaving since 1928. In 1934 he had created four paddle and eight paddle looms and in 1944 he had started a handloom training centre in Hyderabad. In the pre-partition he had started working on Jacquard loom in Pakistan. He created the nucleus for capability in Jacquard design, which, over time became one of the biggest specialties of Panipat. Over the years Jacquard designs have became one of the specialties of Panipat, giving it an edge over many other waving centers in India.

Sardar Ameer Singh was another pioneer among the migrants from Pakistan. He had learnt the craft of making looms in Jhang, Pakistan in 1930s. In 1948 when he migrated to Panipat, he started making looms, thus laying the foundation of loom making industry in the cluster.

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300 He got an award for his woven picture of Jawaharlal Nehru in 1950.
301 The main source of the history of the cluster and the contribution of the migrant community is Chauhan 2001, which is supplemented by oral histories narrated during various interviews. The families of these interviews coming out with these details have had long association with the Panipat textile industry. So much so that their family histories are inextricably linked with the history of the industry.
In recent years, Panipat is also emerging as an important centre for exports of carpets and *durries* apart from being a fast growing centre for exports of made-ups. The history of Panipat carpets and *Durries* is linked with another pioneer who came from the other side of the border after the partition; Anand Sagar Khera, an alumnus of Mayo School of Art, Lahore. He started the first carpet making unit in Panipat in 1951, named as Bharat Carpet Manufacturing Company. Kheras also started the first hand-knotted carpet unit in Panipat. In 1966 they switched over to manufacturing of *durries* and became a well known name in *durrie* making.

Today humble *durries*; the flat carpets without pile, which were traditionally used as the bottom most layer of the bedding have come a long way to become an important export item. For centuries durries have been a common household item in the Panipat Ambala belt, where they were traditionally woven in every household for self consumption and for the dowries of their daughters. They used simple weaves and limited colours to make durries with stripes. Anand Sagar Khera, was instrumental in transforming this simple household item onto an aesthetic life style item of considerable commercial value. Because of the presence of considerable technological capabilities of the cluster he could experiment with new curvaceous motives and floral designs in *durries*. Two capabilities which were helpful in the process were talent for making desired incremental changes in the looms to make them suitable for complex designs, and deep rooted traditional weaving skills of the artisans, due to which they were able to switch over to complicated weaves with considerable ease and without adding much to the labour cost. Names like Anand Khera, along with Sham Ahuja, have been instrumental in placing Indian *durries* on the international map. Today Panipat durries are not only exported, but are sourced by life style retail outlets like Fab India and Central Cottage Industries Emporium for the upper end of the domestic market.

Manufacturing and export of made ups, the product category in which Panipat is perhaps the biggest exporting centre in the country today, was also started by a migrant from Jhang. Amritlal Batra’s National Textiles and General Company, started in 1947, was the first

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302 This is not to suggest that India had no tradition of aesthetic durries as decorative floorings and wall hangings at an earlier date. Calico museum in Ahmedabad has a *durrie* like object which was originally woven in Lahore in circa 1640-50 for the Amber palace of Rajasthan. During the Moghal period Satrangis and kilims; flat carpets made with wool, were quite common. In the early twentieth century durries with magnificent designs were woven in the prisons of Sikarpur, Sindh and in Yarvada South India where durries are referred to as Yamkhanis also has great durrie making tradition. Today Sham Ahuja durries are perhaps the only Indian brand in made-ups and carpet category which is sold under its own name in the international market, which has carved a special niche for themselves in the international market.
unit to manufacture made-ups like cushions, napkins and curtains etc. It started exporting in 1952 to Germany. In 1963 first direct exports to USA were made from this cluster.

The technological capabilities which came from across the border in 1940s have kept growing cumulatively through intergenerational transfer of skills. Most of the children and grand children of migrant families have found their livelihood in the local textile industry. While the first generation migrants operated mostly from the HH units, which were dependent solely on the skills of their owners, most of them have graduated to factory sector, which hires migrant labour from U.P. and Bihar. But most of these entrepreneurs continue to have hands on approach in production. The tacit knowledge about the industry which they have acquired through the process of intergenerational transmission of skills continues to be one of the most important assets for a large number of textile units in Panipat and is perhaps the main reason for their continued association with the industry. Even as the share of migrant community in the industry has gone down in recent decades, their grip on the baton of technological leadership has remained quite firm. Some of the technologically most dynamic units, such as Golden and Mahajan and Sons, are owned by the members of the families who migrated to Panipat at the time of partition.

5.1.2 Cultural Factors

Culturally, social groups associated with the textile industry in Panipat can be divided in two broad categories; Settlers and migrants. Settlers in turn can be divided in two broad social categories; *Baniyas*, the members of the trading communities and *Jats*, the members with agrarian background. Among the migrants who have now settled permanently in Panipat, there are migrants from Rajasthan, who have come to the cluster at various points of time, *Hyderabadi*, who came at the time of partition and went on to become an integral part of the textile industry in Panipat. Apart from these two groups, who are parts of entrepreneurial class, there are some members of the working community who have settled in the city, and are permanent components of the population. In addition to this there are a large number of workers who form the floating component of city’s population. While almost all the members of the entrepreneurial class; both settlers and migrants, are Hindus, a large number of migrant workers are Muslims. However, in spite of two way divide along cast and class lines between workers and entrepreneurs, there is little visible social conflict between the working and non-working classes of the cluster. Perhaps one reason for this is that a very large number of Muslim community are migrant labourers from UP and Bihar, who live mostly on the premises of the
manufacturers and have few forums to network with each other, either as a social group or as an economic class. The other reason for the absence of networking of working class is complete absence of labour organizations in the city in general and in textile industry in particular. Thirdly, the entrepreneurs depend in a big way on the contractors/masters for management of labour. These masters, who act as interface between the entrepreneurs and workers, are often from the same native place and the same social group as the workers. This milieu, in which workers are on the fringe of society, moderates the potential for conflict. But it, also curtails the potential of innovation through learning by interacting, which is facilitated by close contact between workers and entrepreneurs. Unlike Moradabad, where skilled workers are viewed as the most important asset in the cluster, workers in Panipat are a faceless lot.

One of the most important social networks in Panipat is that of Hyderabadi. Though large members of the Hyderabadi community, particularly those who cater to the domestic/local markets, are concentrated in the geographical areas such as S.D. College market and Amar Bazaar and are socially highly networked with each other; this network has little to offer in terms of creating an innovative milieu in the cluster. The members of community, who have strong social interaction with each other, have failed to make it big so far. They are trapped in close social relations which has little to offer them in terms of fresh economic ideas. Their social links with the rest of the cluster are limited and they have little capabilities to draw from outside sources. On the other hand, the highly successful members of the Hyderabadi community, who own big enterprises, are not so highly networked.

One social group whose members seem to be benefiting in economic terms from the social integration of the community are Paliwals; the members of the Brahmin community who came from Pali, Rajasthan to Panipat in the late nineteenth century. Today they are an important part of Panipat textile industry. They have a strong social network, and are known to co-operate with each other in business matters.303

Members of the trading communities, even if socially networked, have little economic co-operation with each other, or with other social groups.

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303 Paliwals are one of the biggest names in the textile industry in Panipat. The main source of history of the association of the community with the Panipat industry is the oral history narrated by Vibhu Paliwal, a young entrepreneur belonging to the community.
The *juggaru* attitude of the entrepreneurs\textsuperscript{304} and their capability to use laws to their advantage seems an important trait of Panipat.

On the whole cultural milieu of the cluster, though conducive for making quick profits in the short run, is not very helpful in facilitating in creating an innovative milieu which would promote long term competitiveness based on technological upgradation and innovation through social networks.

**5.1.3 Developments in the Post Independence Period**

Even though the textile cluster of Panipat has been in existence in Panipat for several decades, it has witnessed fast growth in the last three and a half decades. Its growth rate is further accelerated in post reform period. (See Table 5.1 and Table 5.2). Today the cluster is one of the most important centres for exports of home textiles in the country.

The high growth period of the cluster can be divided in two phases; the period between 1969-70 to 1989-90 and the post reform period; since 1990-91. The decade of 70s witnessed a sharp upswing in the output, which registered a more than ten fold increase in turnover, rising from Rs. 6.6 crores in the decade of 1960s to Rs. 67.3 crores in the decade of 1970s.\textsuperscript{305} The main factor responsible for this high growth trajectory of the cluster in the earlier growth phase was fast proliferation of power-looms which almost completely replaced handlooms.\textsuperscript{306} Since power-loom is a labour saving technology vis-à-vis handloom, during this phase employment grew at a much slower pace, as compared to output. Employment increased by little more than three and half times in the corresponding period. The exports from the cluster were not on an accelerator in the decade of 1970s. They grew at a moderate rate during this phase.

Fast proliferation of power-looms in Panipat was not an isolated instance, triggered by local factors. Rather, the changes in the National Textile policy were the main reason for fast proliferation of power-loom in several parts of the country. Panipat was one of the several

\textsuperscript{304} The expression *juggaru* is a recurring term which surfaced in several interviews. *Juggaru* attitude of the entrepreneurs refers to their ability to manage things somehow or the other. Among others the expression was used by Mr. B.S. Chauhan, who has compiled Encyclopedia of Panipat Textiles and Mr. Siani, the acting head of the NITRA centre.

\textsuperscript{305} Data supplied by office of NITRA centre in Panipat

\textsuperscript{306} Handlooms have bounced back in a big way after their reappearance in 1990s.
power loom centers in the country which saw stupendous growth in the power-loom sector, fueled mainly by the anti mill sector bias in the textile policy of the day.\textsuperscript{307}

Fast diffusion of power-looms in Panipat was facilitated by the virtuous cycle of high profits, high investment in power-looms.\textsuperscript{308} The biggest beneficiaries of this boom were a large number of HH units owned by the migrant families, which were converted in factory units during this period. During this period the cluster became an important supplier of bed sheets and furnishing fabrics for the northern belt of the country. The decade of 1980s also saw a sharp increase in number of retail show-rooms on the Delhi-Panipat road, which were owned mostly by the migrant families who had manufacturing units elsewhere in the city. Apart from having show rooms in the city, the entrepreneurs went to the exhibitions organized by the textile ministry all over the country. A strong government supported co-operative movement was helpful in the proliferation of furnishing fabrics of Panipat all over the country.

The decade of 1980s continued to see Panipat on high growth trajectory. But the growth rates were not as dramatic as those in 1970s. During the 1980s clusters turnover went up from Rs. 67.29 crores to Rs. 158.54 crores, registering an increase of 235% in the decade. As can be seen in Table 5.1, the employment provided by the textile cluster went up by 184% in the same period.

\begin{table}[h]
\centering
\begin{tabular}{|c|c|c|c|}
\hline
\textbf{Years} & \textbf{Number of Units} & \textbf{Employment} & \textbf{Output (Rs. Crores)} \\
\hline
1966-69 & 532 & 5230 & 65 \\
1970-79 & 1640 & 18840 & 673 \\
1980-89 & 3014 & 34788 & 1585 \\
1990-98 & 4011 & 56387 & 1888 \\
1998-99\textsuperscript{*} & 3800 & 66000 & 2000 \\
\hline
\end{tabular}
\caption{Number of Units, Employment and Output}
\end{table}


\textsuperscript{308} According to one observation some units in Panipat experienced a rate of profits as high as 50% in 1970s. Easy availability of bank loans also contributed to the fast growth of power-looms as well as fast growth of turnover in this period.
The dynamic growth of employment in 1980s was fueled by a raw material revolution, brought about by the availability of cheap, man made fiber. Since polyester can be easily woven on power-loom, rather than handloom, Panipat, which was endowed with a large number of power-looms, was quick to take advantage of the polyester boom. A large number of units replaced cotton yarn with polyester yarn for the manufacturing of furnishing fabric which had become the specialty of Panipat. New units which came up during this phase further catalyzed the process. This added to output as well as employment in the cluster. The 1980s political disturbance in Punjab witnessed shift of several spinning units from Punjab to Panipat, giving further boost to the industry.

However, the fastest growth of output and employment in the cluster is registered in the post reform period after 1991. A series of export friendly policies, with attractive incentive package for exporters, brought a sharp increase in the export intensity of this cluster, as in many other clusters/sectors with low start-up costs and high labour intensity. Till mid 1980s the cluster was producing predominately for the domestic market. Exports as a ratio of total output started looking up in 1984-85, when the cluster was entering some new markets, where some of the specialties of the cluster like jacquard designs and punja durries were becoming popular. But the real export boom followed in the post reform period only. The cluster which catered mainly to the domestic market in pre reform period is now producing mainly for the global market. At present at least 60% of the total turnover of the cluster is produced for the overseas markets.

It is in the post reform period that Panipat became a big manufacturer and exporter of made-ups like cushions, curtains and napkins etc. the production and exports of made-ups. Exports of other home textile items like carpets and durries also zoomed in this period. While export units produce a large variety of home textiles, firms catering only to the domestic market, specialize in less value added items like furnishing fabrics and upholstery and bed covers.

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309 For trends in production of man made and cotton fibres in India and in the world and their relative share of in Indian textile industry (See Roy 1998). Roy also shows that power looms used more than 80% of the man made fibers used in India.

310 Though the exact export figures are not available, it is extrapolated by the Office of Textile Committee, Panipat, that at least 60% of output from the cluster is being exported.

311 Some of these firms also produce fabrics like velvet. Firms producing velvet for the lower end of the market, priced between Rs. 45-50 per meter, make it on ordinary power looms. A few firms catering to the upper end of the domestic market, produce velvet on special shuttle-less looms.
TABLE 5.2 - Value of Exports of Textiles from Panipat and India

<table>
<thead>
<tr>
<th>Year</th>
<th>Textile Exports from Panipat (Rs. Crores)</th>
<th>Textile Exports from India in (Rs. Crores)</th>
<th>Panipat Textile Exports as % of All India Exports</th>
</tr>
</thead>
<tbody>
<tr>
<td>1992-93</td>
<td>191</td>
<td>15483.6</td>
<td>1.2</td>
</tr>
<tr>
<td>1993-94</td>
<td>300</td>
<td>18816.7</td>
<td>1.6</td>
</tr>
<tr>
<td>1994-95</td>
<td>450</td>
<td>23701.3</td>
<td>1.9</td>
</tr>
<tr>
<td>1995-96</td>
<td>400</td>
<td>28520.3</td>
<td>1.4</td>
</tr>
<tr>
<td>1996-97</td>
<td>425</td>
<td>33920.2</td>
<td>1.2</td>
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<tr>
<td>1997-98</td>
<td>410</td>
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<td>1.1</td>
</tr>
<tr>
<td>1998-99</td>
<td>640</td>
<td>40171.5</td>
<td>1.6</td>
</tr>
<tr>
<td>1999-00</td>
<td>680</td>
<td>45536.2</td>
<td>1.5</td>
</tr>
<tr>
<td>2000-01</td>
<td>715</td>
<td>51337.3</td>
<td>1.4</td>
</tr>
<tr>
<td>2001-02</td>
<td>1200</td>
<td>57310.5</td>
<td>2.1</td>
</tr>
</tbody>
</table>

Source: Compiled on the basis of the export data provided by Ministry of Textiles, GOI, and Office of Textile Committee, Panipat.

Along with the exports of Punja durries, Chindi durries, exports of carpets from Panipat have also grown at a fast rate in the post reform period.\textsuperscript{312} Tufted carpets, which were introduced with the help of Japanese machinery in Panipat in 1967, have become a part of the identity of the cluster. The cluster which earned a negligible amount from the exports of carpets only in 1987-88\textsuperscript{313} has crossed Rs 200 crores mark in less than 25 years. One of the recent additions to the long and diverse list of items exported from the cluster is terry towel, an item which, at present, has a very fast growing international demand.\textsuperscript{314}

The post reform period has also seen wide spread changes in the organizational setup of the cluster, as well as its socio-economic configurations. Earlier a considerable part of exports, was taking place through Delhi based exporters. But by 2000-01 almost all the exports from the cluster were taking place directly. Firms supplying in the domestic market channel are operating through arms length relations. Post reform period has also seen the fast emergence and growth of both the upstream and down stream activity. Auxiliary industry like machinery and equipment like and ancillary industries packing material, fasteners, etc. have also grown fast in response to fast growth of export items.

\textsuperscript{312} Panipat, which is much junior to other carpet centers like Mirzapur, Bhadohi, Jaipur and Kashmir, is fast emerging as a centre for exports of tufted carpets. Though carpet making started in the cluster in early 1950s, it saw first surge in demand only in 1980s, when the demand for carpets went up sharply as a result of several five star hotels coming into being due to Asian Games of 1982.

\textsuperscript{313} Deepak Woolen Mill had started exports in 1974-75. But soon the mill had closed down.

\textsuperscript{314} Golden Terry Towels, a sister concern of Golden International is also started by Chughs who had migrated from Pakistan at the time of partition.
5.1.4 Structure of the Industry

The Panipat textile cluster is unique among Indian textile clusters in the sense of being a real fliere.\textsuperscript{315} While most of other textile clusters specialize in one or two stages of manufacturing activity, Panipat has a very large number of downstream and upstream activities related to textile industry, ranging from manufacturing of textile machinery to making of textile made ups. Home textiles consisting of made-ups, carpets and blankets etc is the category of the final products in which the cluster specializes. It has down-stream activities like manufacturing of textile machinery, spinning, weaving, dyeing of yarn and fabric and finishing.

However home textiles is the product category which has dominated the cluster in the post reform period. The dominance of Home Textiles activity in Panipat can be judged from the fact that out of the 18 private sector LMEs units\textsuperscript{316} which were registered with DIC in the year 2002-03 as many as 12 are engaged in manufacturing and exports of home textiles; made-ups and carpets.\textsuperscript{317} In addition to the medium and large units, there are a large number of SSI units in the textile sector in the district. As per the information collected for the Third All India Census of SSI, there were 3958 SSI units registered with the DIC, Panipat, as on 31.3. 2001. Of these 2828 were working and 1130 were closed.\textsuperscript{318} Nearly 70% of these SSI units; around 1600, are in the textile sector.\textsuperscript{319} This makes the percentage of working units to total units 71.54%, as against the all India figure of 60.66%, suggesting better than average robustness of SSI in the cluster. Besides the registered units, there are a large number of unregistered SSI units in textile industry.

Units producing home textiles in Panipat have undergone various stages of growth and vertical integration/disintegration over time. Initially these units, which started as small units catering to the domestic markets, carried out weaving and some are dyeing at their premises. For the rest of the activities they depended heavily on sub-contractors and specialized services. In

\textsuperscript{315} In a sense Panipat is a microcosm of textile industry, and terming it as a handloom cluster is a misnomer, more so because Panipat is one of the most important power-loom centres in the country. The name 'handloom cluster' is stuck, probably for historical reasons; the city has had a long tradition of weaving. Though designated as a handloom cluster in the UNIDO database, Panipat is not confined to weaving activity. Therefore it is referred to as textiles cluster, rather than handloom cluster in this project.

\textsuperscript{316} Three public sector units located in the district are; Panipat Oil Refinery, National Fertilizers Ltd. and Thermal Power Station.

\textsuperscript{317} The prominent among them are Abhitex International, Devgiri Overseas, Golden Terry Towels, Harison Harilaj, Paliwal India Private Ltd. and Raveria Textiles. There is one hosiery unit and one fabric making unit.

\textsuperscript{318} The figures are provided by DIC Panipat.

\textsuperscript{319} Pickles making industry is the second most important activity in Panipat. This industry which has a very high visibility in the city of Panipat. The district also has a significant number of SSI units engaged in manufacturing of agro machinery, which are locate in Samalkha, the town adjacent to Panipat city.
the second stage of their growth, their dependence on sub-contractors went down as they started performing almost all the manufacturing activities under one roof. But soon, in order to avoid the provisions of Factory Act, and to avoid taxes, they started separating dyeing and processing activities from the weaving units. In the third stage, as their work expanded at a fast rate, they started sub-contracting some activities. Even the core activity like weaving was sub-contracted. A part of sub-contracting was done to masters, who were located on their own premises, while a considerable part of sub-contracting work went to jobbers. Most of these jobbers were masters at one point, who have now opened their own units and have become suppliers to the exporters. Since the bigger units accumulated considerable surplus in the third stage of their growth, now they are going in for modernization, which is accompanied by significant vertical integration and considerable amount of investment in machinery and equipment.

The manufacturers/suppliers of the end goods in Panipat operate through several different market channels and are inserted in very different type of value chains. In a broad sense, the firms producing the end items can be divided in three categories on the basis of the market channels through which they are operating; firms catering exclusively to the export market, firms catering simultaneously to the domestic as well as export market and the firms catering exclusively to the domestic market. There are nearly 250-300 exporters, exporting a large number of items like bed sheets, cushions, curtains, table linen, bathroom linen, carpets and durries. While some of the smaller exporters confine themselves to a single item like carpets or durries, most of the bigger units have diversified in the last few years.

Exporters are supported by nearly 1000 suppliers, and a large number of providers of specialized services. Some of the export units are vertically integrated and carry out an entire range of manufacturing activities. But almost all of them do sub-contract one or more stages of production. Sub-contracting may take the form of out-sourcing a part of activities like weaving, or having in house sub-contractors. Most of the exporters, barring a few, also depend on one or more specialized service providers.

320 Masters are an important aspect of the production system of the cluster. According to one exporter, in addition to having technical knowledge, they have consider clout over the migrant labour and are instrumental in keeping labour problems away. They are also experts in dealing with bureaucracy and in methods of circumventing various legal provisions.

321 Local market is considered as a part of the domestic market and hence not considered separately.

322 The number of units in different categories are extrapolated on the basis of information provided by the Directory prepared by Chavan (2001).
The cluster has nearly eighty design centers. Five of the design centers have CAD-CAM facilities. The cluster has considerable presence of spinning activity. There are more than 300 spinning units in the cluster. The cluster has a very large number of units specializing in dyeing and processing of yarn and fabrics. There are nearly 300 - 350 dyeing units in the cluster, of which nearly a dozen have facilities for cone dyeing. There are 10 colour matching centers. The cluster also has specialized service providers for weaving. Not only are there a large number of stage manufacturers doing weaving on handlooms as job work, there are specialized facilities for broad width weaving on shuttle-less looms.

Among the down stream activities, machine manufacturing is an important component of the cluster. Today Panipat has more than half a dozen important manufacturers of textile machinery, in addition to 100 odd small units for manufacturing and repairing of machinery. Among other things, Panipat is an important centre for manufacturing of handlooms and pit-loom which are supplied in different parts of the country.\textsuperscript{323}

In addition to the manufacturing units, the cluster also has a large number of trading units engaged in the sell of various inputs required for the final goods. There are a large number of dealers of textile machinery, including all types of new and second hand imported equipment. Different types of shuttle-less looms including Jacquard, Rapier, and Sizzler looms and their spare parts are available in the cluster. It has several stockiesta of reputed Indian and international brands, who sell a range of dyes and chemicals suitable for various fabrics and yarns. The cluster has the biggest Shoddy yarn industry in the world. It has more than 300 units engaged in the spinning and processing of shoddy yarn and making blankets from it.\textsuperscript{324}

5.1.5 Organizational Setup of the Cluster

The manufacturing activity in Panipat is carried out through a complex sub-contracting net-work, in which the end producers depend on a whole range of stage manufacturer and/or specialized service providers. The pattern of dependence, the list of sub-contracted activities and

\textsuperscript{323} Today Panipat has over 100 units manufacturing pit-loom hand looms of all kinds. Not only are these units meeting all the requirements of the Panipat industry, they are supplying looms to other weaving centres in the country. The looms manufactured in Panipat include special, looms for weaving carpets, jute mats and durries. Jacquard and Dobby, looms, used for fabrics with woven designs are also manufactured in Panipat. Weaving accessories like pem and cone winders, bobbins, reeling machines etc. are also manufactured in the cluster. Several kind of dyeing machines like semi-automatic jiggers, pedal dyeing and cabinet dyeing machines are also manufactured in the cluster. It produces equipment like boilers, air compressors, steam and electrical calendaring machines, carding machines and ring frames. There are a large number of units producing accessory items for the industry like packing material, synthetic cushion fillings.

\textsuperscript{324} Since this segment is huge, it deserves to be treated as a separate cluster. For this reason the sub-sector is excluded from the scope of the present project.
the pattern of sub-contracting varies from unit to unit. There are virtually no wholly integrated units in the cluster, which carry on all the activities in the value chain, including spinning, yarn dyeing and finishing, weaving fabric dyeing, finishing of fabric, and cutting stitching and finishing of made ups. Even most of the big units also depend on specialized sub-contractors for some specialized services. Even those firms which have most of the facilities in-house may get part of the activity done from outside. Suppliers or venders, as they call them in the cluster, may supply near finished products like durries, napkins and carpets etc. Some activities, like weaving and stitching may be sub-contracted to in-house contractors or masters Some of the big firms, with scale intensive facilities like processing, may do capacity sub-contracting for small firms. Some firms have sister concerns, which do specialized jobs for them, as well as for other firms in the cluster.

5.2 TECHNOLOGICAL INNOVATION IN THE TEXTILE CLUSTER OF PANIPAT

5.2.1 Nature and Extend of Technological Change

This section gives detail of the nature of technological innovations which have taken place in the cluster in the post 1991 period. The section gives a detailed account of the process, product and raw material changes brought about in the cluster. It discusses the extent of diffusion of each one of the innovations, by looking at the number of firms which have brought out each one of the changes.

5.2.1.1 Process Innovation

Evidence from the Panipat case study refutes the hypothesis that clusters of SMEs belonging to the traditional sectors are good only at product innovations and they experience little change in process technologies. Change in process technologies/machine base is by far the most important form of technological change taking place in Panipat. Though the cluster is far from the technological frontier, it has experienced considerable change in process technologies used at various stages of manufacturing. There has been a significant machine based technological change in the post reform period.

In addition to upgradation of process technologies in the core manufacturing activities in the textile industry, has seen several incremental innovation in machinery and equipment which is prompted by the product/ raw material innovation in the cluster. They include changes in loom designs, to make them suitable for new products/raw materials. Several firms have got locally fabricated machines for tufting and making of chenille yarn. This section presents an
account of the technologies used at present and the changes which have taken place in the core activities in manufacturing of Home Textiles in Panipat in the post reform period.

**TABLE 5.3 - Technologies Used in Core Manufacturing Activities**

<table>
<thead>
<tr>
<th>Activity</th>
<th>Number of Stage Manufacturers</th>
<th>Technologies Used by the Cluster Firms</th>
<th>New Technologies Introduced/Diffused since 1991</th>
<th>Use of Machines with Electronic Controls since 1991</th>
</tr>
</thead>
<tbody>
<tr>
<td>Designing</td>
<td>80 design centers In-house design divisions with big units</td>
<td>Manually with pegs. CAD-CAM</td>
<td>CAD-CAM with 5 design centers and many big units</td>
<td>CAD-CAM</td>
</tr>
<tr>
<td>Spinning of Yarn</td>
<td>Spinning units. In-house facility with some big units</td>
<td>Ring-frame spinning, Open End spinning</td>
<td>Open End spinning with 68 spinning units and a few composite units</td>
<td></td>
</tr>
<tr>
<td>Yarn Dyeing</td>
<td>300 Specialized units In-house facility with large number of units</td>
<td>Tankie dyeing, Cabinet dyeing, Cone dyeing</td>
<td>Cone dyeing with 12 specialized units, and some composite units.</td>
<td></td>
</tr>
<tr>
<td>Weaving</td>
<td>More than 1000 jobbers. In-house weaving with a large number of units</td>
<td>Handloom, power-loom, shuttle-less loom</td>
<td>1200-1700 Shuttle-less looms, with specialized units and</td>
<td>Automatic shuttle-less looms with a few big units</td>
</tr>
<tr>
<td>Fabric Dyeing</td>
<td>300 Specialized dye-houses. In-house facility with a very large number of units</td>
<td>Manual, semi-automatic and automatic jiggers, Soft-flow dyeing technique</td>
<td>Soft-flow dyeing technique with at least one unit.</td>
<td>Soft flow dyeing machines, stinters with automatic controls with very few big units.</td>
</tr>
<tr>
<td>Testing/Quality Control</td>
<td>NITRA and a few private facilities. In-house facilities with some units</td>
<td>Electro-mechanical. Electronic</td>
<td>Computer colour matching, as in house facility with at least with one big firm</td>
<td>Computer colour matching equipment, electronic checking machines</td>
</tr>
</tbody>
</table>

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The core manufacturing activities involved in the making of home textiles include; spinning, dyeing of yarn, designing, weaving, fabric dyeing, finishing, testing, stitching and packing. Tufting is done for certain items. Table 5.3 gives a summary view of the core activities involved in manufacturing of home textiles and the range of technologies which are being used in the cluster for each process. It also lists the technologies/machines and equipment which have been adopted in the post 1991 period.

**Designing**

Designing is one of the activities which has seen significant technological upgradation in last ten years. Fabric designing has been one of the strengths of Panipat firms, which is famous for its floral and other designs, woven on jacquard looms; both handlooms and power-looms. Panipat has seen fast diffusion of use of CAD-CAM in fabric designing since 1995. Not only have most of the big units acquired the facility, it is easily available to the small units, which can avail of the services of one of the five design centers which have CAD-CAM facility. These centers make it possible for small firms to upgrade their products and introduce colour and design flexibility in their fabrics through the use of micro-electronic tools. The private sector facilities for CAD/CAM are in addition to the facilities available in government agencies, NITRA and WSC. Though none of the sample firms reported using the government facilities for designing, the NITRA in-charge claimed that most of the persons running private CAD/CAM facilities were trained in NITRA.

Due to the presence of considerable design capabilities in Panipat, now a large number of the designs for export items are developed in the cluster with indigenous skills and shown to the foreign buyers, who select the design. One limitation of the centers is that while they do

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325 While the use of CAD-CAM has enhanced the capabilities in woven designs, the cluster has not mastered the technique of printed designs. There are limited facilities for screen printing and transfer printing provided by specialized units. But they are not adequate. Some units, using printed fabric for made ups, get printing done from places like Ahmedabad and Jaipur.

326 According to Mr. Chugh, owner of one of the biggest and fastest growing firms in the cluster, for a while Panipat seemed to be loosing the edge it has over other clusters in terms of jacquard designs as it was beaten by China even in jacquard designs. China could re-produce most complicated traditional Indian design with the help of CAD-CAM at a cost lower than that in Panipat. In the last five years Panipat has regained its advantage in jacquard designs, by making extensive use of micro-electronic tools.

327 This is quite an advance over the earlier situation, where buyers, particularly from countries like Japan, used to bring their own design sketches. They used to stay in the city for several days and personally supervise the development of design. Now development of design is not a problem. Exporters get the samples made. Foreign buyers come for couple of days in the cluster, visit several vendors and give orders to the vendor with most competitive price. Even in the cases where designs are provided by the foreign buyers, the entrepreneur and workers use their creativity to make modifications on the designs.
have skills to produce/modify a design electronically, they do not have professionally qualified design experts. However, some of the big units, which have their own design/product development divisions, are employing professionally qualified designers. Unlike Moradabad, some firms in Panipat have now employed graduates from NIFT and NID among their permanent staff. One of the big export firms, Devgiri Exports, which operates from Panipat as well as Jaipur, has as many as 50 qualified designers, who are trained in NIFT, NID and JJ School of Art. The design centre of the firm is headed by a highly qualified person with a degree in textiles as well as in design. According to him designing capability is the core competence of their firm and the firm is ready to offer salary structures which are comparable or better than the ones offered anywhere else in the country. Another firm, operating in both the markets, reported making use of services of an American designer. Some other firms take advice from the NIFT graduates. But the number of firms making use of highly qualified design professionals may not exceed half a dozen. The total number of professionally qualified designers in Panipat is still small. As a result, in spite of considerable traditional skills and CAD-CAM facilities, Panipat is making little headway towards design autonomy. Most of the exporters still produce against designs which are either provided by the foreign buyers, or approved by them.

**Spinning**

Panipat has seen very considerable increase in capacity in spinning activity in the post reform period. It has also seen some upgradation in spinning technology. Proliferation of open end spinning technology is one of the most important developments in spinning in the post reform period in the cluster. In early 1990s, when only the ring frame technique was used, a large number of second hand rotor spinning machines were used by cluster firms. Gradually second hand rotor spinning machines, which involve considerable wastage of raw material and run into several quality problems, have been phased out and are now replaced with new machines. Many units have introduced electronic cards in place of electro mechanical cards. Use of new vintage spindles with latest technology in some units has increased productivity.328

In the meanwhile several big units in the cluster have started vertically integrating spinning in order to be able to use of better technology; open end spinning. Several specialized units offering open end spinning facilities have come up in the cluster. In 2001-02 there were as

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328 For productivity gains through use of new spinning technology (See Bedi 2003).
many as 68 units using open end spinning technology. But not all the spinning in the cluster is done with open end spinning technique. Many spinning units continue to use ring frame method. But most of them are using better quality equipment than before.

In spite of considerable increase in capacity and change in technology, the spinning sector in only 40-45% of yarn consumed by the industry in Panipat is locally made. Panipat is far from the international or even the national technological frontier. The cluster does not have capabilities for spinning of synthetic yarn, or fine count cotton yarn. There is no spinning facility for spinning yarn in counts finer than 2/20. High cost of plant for making synthetic and fine count cotton yarn is a deterrent for the firms in Panipat which are either small or medium sized. While the local spinning units meet most of the requirements of the woolen yarn for carpets and coarse cotton yarn for the handloom sector, the cluster firms continues to meet their requirements of fine count cotton yarn as well as synthetic yarn, by purchasing yarn from spinning mills like Vardhman, Grasim, Arihant and Bhilwada etc. who have their stockiest in Panipat. On the whole, according to Mr. Garg, president of All India Shoddy Wool Association, technologically spinning segment in Panipat is not impressive.

Weaving

Weaving is one of the core activities in the production chain of home textiles and the most important activity for several items such as carpets and durries. The pattern of use of different technologies in weaving has seen drastic changes from time to time. At present a whole range of weaving techniques from primitive pit looms and handlooms to state of art automatic shuttle-less looms are in use in Panipat.

Understanding the change in process technology in weaving in Panipat is an interesting exercise. Though there have been significant changes in weaving technology in Panipat, the cluster has not seen the usual sequence; moving from manual to electro-mechanical to electronic technologies. While the 1970s and 1980s saw a drastic shift away from manual (handloom) to electro mechanical (Power-loom) technology, strong force of demand pull in the post reform period has brought partial re-switching to handlooms.

329 Open end spinning is suitable only for rough count yarn with the counts 2, 4 and 6.
330 Whereas the cost of installing plant for spinning low count cotton yarn varies between Rs. 2-3 crores, the plant for high count yarn costs Rs. 7-8 crores. Making filament yarn; yarn made from man made fibers such as polyester and acrylic yarn requires considerably higher technological capabilities and higher investment in plant and machinery. The cost of installing filament yarn plant can vary between Rs. 20-25 crores.
331 (See Ramkrishan et al. 2002) to see trajectory of handlooms in various districts of Haryana.
The process change in weaving which has come about in the cluster could best be described as schizophrenic; change has been taking place at both the ends of technological spectrum. On the one hand recent creation of niche for handmade items in the global market has resulted in revival and fast diffusion of handloom technology, which lies at the lower end of the technological spectrum. On the other hand, market pressure for finer variety made-ups has triggered fast diffusion of shuttle-less looms. With the growing pressure for higher quality, some big firms have started using shuttle-less looms with electronic controls, which lie on the higher end of the technological spectrum.

There are almost mutually exclusive, non-overlapping areas of existence for three different technologies in weaving; handlooms, power-looms and shuttle-less looms. Handlooms are used to weave heavy fabric items like durries, carpets and napkins etc., mainly for the export market. These items are made of rough count cotton and other yarns like wool and chenille etc. An attempt to weave durries on shuttle-less looms did not succeed in Panipat.

Power-looms, which dominated the weaving activity in Panipat in 1980s, are still used quite extensively. Most of the items for the domestic market, like furnishing fabrics and bed covers, are woven on power-loom. Power-loom is also used by some units for the weaving of cotton fabric for made ups. A large number of power-looms have retrofitted jacquards. Jacquard and Dolby looms are used for weaving fabrics with woven designs. While Dolby looms are used for small motifs, Jacquard looms are used for big floral designs. Jacquard is Panipat’s favourite loom.

Shuttle-less looms are used for weaving fabric for the upper end cut and stitch items, made from fine counts of cotton yarn. They are also used for the weaving of broad width fabrics for double bed sheets, which are becoming an important value added export item. Diffusion of shuttle-less looms, which were introduced in Panipat only in early 1990s, has been fast, as compared to other weaving centers in the country.

Evidence of process change taking place at both the ends; revival of handlooms and introduction of shuttle-less looms, shows big chinks in the neo-classical thinking, according to which change in technique is introduced in order to reduce cost. Even as the cost of weaving per meter on power-loom continues to be lower than that on handloom and shuttle-less loom, in

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332 Of the 27sample firms reporting use of power-looms, 12 belong to the D category. They make use of no other technology for weaving. Of the remaining 15 firms using power-looms, 4 belong to D&E category, while 11 are in E category. But unlike D category firms, none of the D&E category or E category firms relies exclusively on power-looms. For most of the export units only a small fraction of weaving is done on power-looms.
Panipat, both; the low tech handlooms and high tech shuttle-less looms have grown at a faster rate as compared to power-loom, in the post reform period. This negates the neo classical premises that firms always opt for the cost minimizing technique. Evidence from Panipat suggests that cost minimizing technique is not necessarily the optimum choice of technique. In fact, unlike the neo-classical assumption, in reality no two techniques are perfect substitutes for each other, in the sense of producing identical products. It is rare to be able to introduce changes in process technologies, keeping the vector of product characteristics unchanged. Process change is almost invariably, accompanied by change in some of the functionings/characteristics of the product. To put the argument upside down, change in technology may be necessitated if change in the characteristics of the products is desired. Shuttle-less looms are used in Panipat not for their cost saving but for the fine quality of fabric they weave. Though labour productivity of shuttle-less looms is much higher as compared to both power loom and hand loom, due to the high machine cost, cost per unit of weaving on most of the shuttle-less looms is higher than that of handlooms and power looms. Shuttle-less looms are used by exporters and the firms operating in the upper end of the domestic market.

Fast diffusion of low tech handlooms on the one hand and as well as high tech shuttle-less looms on the other hand, can be attributed to the changing product mix of the cluster, which in turn is the result of change in the tastes of the consumers as well as change in market channels to which the cluster is catering. Since an increasing percentage of the cluster’s output is now being produced for the export market, the items specific to export sector are dominating the production vector of the cluster. Enhanced export opportunities, accompanied by growing global demand for hand-woven items like woven carpets, durries, and heavy fabric napkins has

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333 Power-loom, the loom which was responsible for fast growth of the cluster in 1970s and 1980s, continues to be the most cost effective loom. While locally made pit-looms/handlelooms may cost as little as Rs. 5000, new power-looms cost around Rs. 50,000, where as old one is available for Rs.25000 or less. But since the labour productivity on power-loom is ten times and the unit cost of weaving on power-loom is lower than that of handloom. With the fall in polyester prices, for which power-loom is the preferred loom vis-à-vis handloom, the items for the lower end of the domestic market, where price competition is fierce , including even the traditional items like durries are now being woven on power loom. The cost effectiveness of power-loom sector, vis-à-vis mill sector is enhanced due to low labour cost which power-loom units can enjoy by virtue of being part of the unorganized sector, and also due to the provisions of the textile policy, which accords the power-loom sector various tax exemptions. With the rationalization of the tax structure and due to imposition of VAT, apart of the advantage that power-loom enjoyed, has since been neutralized.

334 Among the sample firms 17 firms are using fabrics woven on shuttle-less looms. All but one of them is operating in the export market; four belong to D&E category, and 12 to E category. Only one small firm which has purchased two shuttle-less looms, belongs to D category. But the reason for its purchase of shuttle-less looms is that it is preparing for entering the export market.
brought back handloom in Panipat. The loom which had been almost completely replaced with the power-loom in mid eighties, has staged a come back with a vengeance. For some items handlooms are used on the insistence of the buyer on hand-woven products. For some narrow width items like napkins and throws, width of a standard power-loom is too big. Since the cluster does not have capabilities to modify the width of power-looms, handlooms of suitable size, which are manufactured with in the cluster, are used. Handlooms are also used them for heavy fabric items like durries and carpets, for which power-looms are not suitable. Pit-looms are used for these items. Handlooms, retrofitted with jacquards, are used for weaving designs on heavy fabrics. The easy availability of highly skilled migrant weavers from UP and Bihar, have made re-switching to handlooms in Panipat a cost effective process. Presence of considerable loom making capability in Panipat has also contributed significantly in the speedy revival of handlooms, which are suitably modified with in the cluster to meet the changing requirements of the market. Another important reason for the coming back of handlooms is that handloom items are exempt from the country specific quotas imposed under the MFA, in several countries. This means that items woven on handlooms could be exported to these countries without quotas. As a combined effect of all these factors, today there are more than 40,000 handlooms operating in Panipat. Most of these looms are simple looms. Pit looms are used for weaving of durries and heavy fabric napkins etc.

Three most commonly used handlooms in Panipat are; pit-looms, the panja looms and the frame looms. Pit-looms, the most primitive type of looms, which are set in a pit dug in the ground, are used mainly for weaving cotton and chenille durries. The punja looms is used for making heavy durries, with tight weave, and frame looms are used mainly for making tufted carpets. Fast diffusion of frame loom for carpet weaving is on account of two factors. Firstly, big frame looms can be used for broad width carpets. Secondly, unlike woven carpets, which can have geometrical designs, tufted carpets can have larger variety of designs.

335 The observation that the handloom is the loom for the export sector is supported by the evidence from the firm level survey; of the 28 sample firms using handlooms 27 are operating either fully or partially in the global market. All the 25 export units and two of the six units operating in both the markets are using handlooms for weaving. In contrast of the 13 firms operating exclusively in the domestic market, only one very small firm is using handlooms. This firm, producing hand-woven durries for the lower end of the market, is preparing to replace handlooms with power-looms. The remaining 12 firms in the D category use only power looms.

336 Owner of a small export house, who specializes in the exports of napkins and table mats, said that he had tried hard to design and fabricate a narrow width power-loom with the help of local machine manufacturer, but his efforts did not succeed.
Diffusion of shuttle-less looms has been fast in the cluster. The cluster which had no shuttle-less looms till 1990 could boast of more than 1000 shuttle-less looms at the turn of the Century. Almost all the shuttle-less looms used in Panipat are imported second hand looms. While some big firms in the cluster have purchased new looms, a large number of firms have gone in for second hand looms, whose supply is augmented due to considerable relocation of textile industry from the developed to the developing world.\(^{337}\) Fast diffusion of shuttle-less looms would not have been possible without the easy availability of imported second hand looms.

Use of shuttle-less looms is fueled by the fast growing demand for fine quality bed linen and made ups. Several firms have purchased shuttle-less looms since broad width bed spreads can be woven only on shuttle-less looms. Similarly several firms going for higher value added products have purchased shuttle-less looms. There are several units in the cluster specializing in weaving on shuttle-less looms, who do job work for other firms. In last five years shuttle-less looms are being used for weaving of fine quality woolen carpets and velvet. While most of the shuttle-less looms used in the cluster are electro-mechanical machines, some big firms have purchased looms with electronic controls.\(^{338}\)

Use of advanced technology in weaving; namely shuttle-less looms, is not constrained by supply side factors such as the size of the firm or its technological knowledge/capabilities. Use of shuttle-less looms is not confined to big firms.\(^{339}\) This suggests that cost is not a constraint in going in for ordinary shuttle-less loom. Since a second hand shuttle-less loom costs as little as Rs.2 lakhs, many small firms have also purchased them. However, shuttle-less looms with electronic controls, which may cost as much as Rs. 20 lakhs and more are out of bounce for small firms.

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\(^{337}\) Most units, including the biggest units have purchased second hand looms from countries like Germany and Italy which are priced between Rs.2 lakhs to Rs. 15 lakhs. The price of new loom of the same brand may be as much as Rs.50 lakhs per loom. Some of the units have however acquired latest vintage new looms. One unit reported purchasing new jacquard looms for Rs.25 per loom. According to the entrepreneur, the RPM of latest vintage looms is much higher than the second handlooms and their productivity is six times.

\(^{338}\) Barring a few big firms, the firms in Panipat don’t use looms fitted with electronic jacquards. The reason given for this is that the use of electronic cards requires dust free atmosphere, which the Panipat firms can’t provide.

\(^{339}\) Of the 14 firms having shuttle-less looms, two are very small and 4 small firms. Out of the 17 firms using shuttle-less looms 14 firms have purchased them for in-house weaving, while three more are making use of specialized shuttle-less loom units. Among these three firms one is a big export oriented firms. Since made ups which are only a small fraction of the firm’s exports and since the entrepreneur look at them as the transitory component of their exports, they have not invested in the purchase of shuttle-less looms.
According to some expert the number of shuttle-less looms in the cluster has grown at a fast rate and is between 1200 to 1700. This may roughly constitute 3-5% of all looms in the cluster. Considering the overall percentage of shuttle-less looms in India, which is less than 1%, this is an impressive number. However, the cluster has to go a long way in upgrading its weaving technology, if it has to retain its long run competitiveness, because this percentage of 3.5% is much lower, not only as compared to countries like Korea and Thailand, where more than 80% looms are shuttle-less, but also Pakistan.

**Yarn Dyeing**

Another process in which Panipat has seen some technological upgradation in recent years is **yarn dyeing**. At present cabinet dyeing is the most common method for yarn dyeing in the cluster now. Earlier **tankie** dyeing, an obsolete technique was the most commonly used technique in the cluster. Not only is **tankie** dyeing a highly polluting technique, it gives poor results in terms of colour consistency and colour fastness. Due to the pressure from the HPCB (Haryana Pollution Control Board), and also due to opening up of several modern dyeing facilities, **tankie** dyeing is almost on its way out from the cluster. At present it is used either by very small firms units which are in the process of establishing themselves as exporters or by the flying by night type of exporters, who are playing a one time game. A few firms use it for sampling purposes.

**Cone dyeing**, the most advanced of the three yarn dyeing techniques used in Panipat, was introduced in the cluster in last few years. It is getting diffused at a fast rate. Several big units have introduced in-house cone dyeing facilities. In addition to this, there are around a dozen dyeing centers in the cluster which have introduced cone dyeing facilities. These centres conform to the international quality norms, such as the use of azo-free dyes. Most of the reputed dye-houses also have standardized drying facilities, which are availed by small firms, especially in the rainy season. The units which avail of dyeing facilities of these centers belong to all sizes.

Process houses attached with a big units prefer to out-source their facility if the amount of dyed yarn used by the unit is less than what would be economically viable. None of the very

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340 Among the sample firms, 15 need no yarn dyeing; twelve of them buy synthetic dyed yarn, two small firms do only printing and one medium size firm supplies blankets in natural colour, since its buyer UNHCR considers dyeing eco-unfriendly. Of the 30 units going for yarn dyeing 21 units use cabinet dyeing technique. Seventeen of these 21 units have in house cabinet dyeing facilities. The firms using cabinet dyeing include all the six big firms, 10 medium size and five small firms. Some of these 17 firms, using cabinet dyeing, also have in-house cone dyeing facilities. Four of the sample firms, all small firms, get yarn dyed from the specialized dyeing units using cabinet dyeing technique.
small/small firms have in-house cone dyeing facility. Un-affordability of cone dyeing facility by small units is demonstrated by the fact that among the sample firms having in house cone dyeing facilities all have a turnover exceeding Rs.25 crores.\textsuperscript{341}

\textit{Fabric Dyeing}

Though most of \textit{fabric dyeing} in Panipat is done with the help of intermediary technology; semi-automatic jiggers, some of the cluster firms use \textbf{automatic jiggers}. But their diffusion is slow. The high pressure, high temperature, precision dyeing carried out with the help of good quality jiggers is a rarity in Panipat Though the cluster has large number of automatic and semi automatic jiggers, a large number of firms, in all size categories and in all market channels are still using primitive manually operated jiggers. As many as 11 units are still using manual jiggers. Of these 7 belong to E category, 2 belong to the D&E category and 2 to the D category. These 11 firms using primitive technology belong to size categories ranging from very small to big.

Five of the sample firms having semi automatic jiggers are exporters. Among the 11 sample firms using \textbf{advanced automatic jigger}, 7 have in house facility, while 4 out source it. The 7 of the sample firms, which have automatic jiggers, belong to the medium or big size category. Of these 7 firms 5 belong to the E category and 2 to D&E category. Among the firms making use of specialized facility, 3 are small firms and one is a big firm with a turn over of Rs. 50 crores. Of the three small firms getting fabric dyeing done on automatic jigger two belong to E category and one to D category. The later is supplying through an unconventional market channel in the domestic market. It is supplying to the police and to air lines, where quality norms are stringent.

While some of the jiggers used in the cluster are manufactured locally, most of the firms use non-branded semi-automatic jiggers made in places like Ludhiana. The non-branded jiggers cost Rs.4-5 lakhs as against the good quality branded jiggers which may cost as much as Rs. 20 lakhs.

\textsuperscript{341} Only four of the sample firms, all with a turnover exceeding Rs. 25 crores, have in house cone dyeing facilities. In addition, seven firms are availing of services of the cone dyeing centers. Of these 7 units three are small units, two medium size and one big unit. The big unit, with a turn over of Rs. 50 crores, which is outsourcing cone dyeing has in -house cone dyeing facility. But since its requirement is less than the critical volume for which cone dyeing is economically viable, it prefers not to use its own facility.
A few firms have also acquired state of art soft flow technology for fabric dyeing. One of the sample firms, the technologically most advanced firm in the cluster has the soft flow technology for fabric dyeing.

Variety of fabric and yarn dyeing facilities made available by the dyeing centers makes it possible even for the smaller firms to produce better quality products at competitive cost.\(^{342}\) They can dabble freely in experimenting with various combinations of different type of yarns and fabrics and come up with innovative products/finishes.

Though, due to shift from primitive to intermediate technology in yarn dyeing and fabric dyeing, colour fastness of Panipat products has improved over time, colour fastness count of an average Panipat product is around 3, as against the maximum of 5 in best quality dyeing. Another chink in the capabilities of the cluster is that it does not have any facility for fiber dyeing, which is technologically more challenging, and gives better results in terms of consistency and colour fastness.

**Finishing**

In recent years several facilities for fabric finishing such as mercerization, decadizing, sanforization etc. are introduced in the cluster, either as in-house facilities or as specialized services. Several finishes like fire resistant, water proof, non-skid and wrinkle free finishes have also been introduced by some firms. In order to improve the final look of made ups several units have introduced upper end facilities for dry cleaning and ironing Panipat also has introduced some specialized finishing facilities, not available in other clusters, such as facility for tumbler washing, which is required to preserve the locks of the tufted fabrics. But on the whole chemical processing and finishing are the activities which have not seen adequate upgradation. For example the cluster does not have any facility for sizing of the yarn.\(^{343}\) Due to high cost of sizing equipment, and its scale economies, it is not viable for small individual units. Nor are there any specialized units for sizing in the cluster. Since sizing is necessary for fine count yarn, the cluster firms are confined to using not so fine yarn. Due to their size most of the firms can’t afford to hire process managers. Nor are there any service centers for providing consultancy for chemical processing. As a result finishing and processing of Panipat products in terms of dyeing, processing and stitching compares unfavourably, not only with European and Chinese products, but also with products from countries like Pakistan. According to one exporter, due to

\(^{342}\) Good quality yarn dyeing is done in the dye houses for Rs. 5 pkg.

\(^{343}\) Sizing is a treatment which is required for fine count yarn like 2 by 60, for increasing it’s strength.
its inability to provide products with good quality and good finish, vis-à-vis its rivals, the unit value realization of Panipat products has been going down sharply.

**Testing**

Another serious technological gap which keeps the cluster away from technological frontier is lack of culture of testing in Panipat. Testing is done for mainly for fulfilling buyers' requirement rather than as a tool for process optimization or quality control. Few firms use testing for increasing efficiency and quality. In rare cases firms have purchased equipment like computer colour matching and electronic checking machines for maintaining quality. But their diffusion is very low.

Another chink in process technologies is presented by the fact that there is little attempt at process optimization through optimal use of machinery. There is no energy audit undertaken by the firms. Even if some state of art machinery is imported, not all its functions are used. Lack of technological knowledge about the machine often leads to sub-optimal use of the machines resulting in higher cost, lower quality and higher maintenance cost. There is no concept of preemptive maintenance. This means that even in processes where state of art machinery is being used, due to its inefficient use, realized the productivity and quality is less than optimal.

On the whole, recent upgradation in process technologies notwithstanding, the cluster continues to be away from the international technological frontier in terms of process technologies; there exists considerable gap between the global best practices or even best practices in India and those adopted in Panipat. For example, in spite of its considerable spinning capability, Panipat’s synthetic yarn and fine count cotton yarn requirement is still met from outside sources. Moreover, considerable part of spinning taking place in the cluster is done by the old ring spinning technology. Though several state of art dyeing facilities have come up in the cluster, in addition to several big units having in house facilities, traditional dyeing method for yarn has not disappeared altogether, and considerable amount of fabric dyeing is done with the help of manual or semi-automatic jigger. Though diffusion of cone dyeing for yarn dyeing has been fast, state of art soft flow technology for fabric dyeing is confined to a couple of units. The cluster has no fiber dyeing facility. Though in recent years processes like mercerization and wrinkle free treatment have been introduced by the cluster for

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344 In the case of break down of a sophisticated machine, it is not uncommon to replace it with cheaper local parts, which have inferior features and lower productivity. Use of sub-standard parts results in malfunctioning of the machine and further breakdowns.
better finish of the products, the cluster still does not have facility for ‘sizing’, which is important for moving to higher end markets. Processing, finishing testing facilities continue to be poor. Testing is done only as per requirement of the buyer, rather than being used as a tool of process optimization. With a couple if exceptions there is no facility for computer colour matching, either at the cluster level, or with firms. There is little attempt to achieve technical efficiency through energy audit or through pre-emptive maintenance. Even when the state-of-art imported machines are purchased in most of the cases specialized features of the machines remain unused due to lack of expertise at the firm level as well as at the cluster level. Few firms are familiar with the concept of pre-emptive maintenance. As a result, most of the firms have considerable ex-inefficiency caused by the in-optimal use of existing machines and equipment. This is caused mainly by the lack of technological capabilities of the firms and absence of technically qualified staff. While the quality of the products produced in the cluster has gone up in recent years, the cluster does not have any brand value. In-fact even today Panipat is regarded as a negative brand by several foreign buyers.

5.2.1.2 Product Change

Due to presence of a large number of stage manufacturers and easy access to all type of machinery, equipment and raw materials, and adequate financial resources, the cluster offers enough flexibility for the firms to swiftly enter new products/product ranges, in response to changes in the global demand.

Most of the textile products manufactured in Panipat goes under the rubric of home textiles, Home textiles include items like bed covers, durries, bath mats, floorings, carpets and made ups. Term made ups refers to the cut and stitch items in the category of home textiles. They include items like cushions, cushion covers, curtains, and napkins etc. In terms of value addition they can be placed some where between the category of unprocessed textile items like saris and dress materials etc. and the category of RGM (ready made garments), which require higher/finer level of processing capabilities than made ups. Made ups is the fastest growing category among export items. Many firms, not producing made ups earlier, have diversified and have started producing them in last few years.345

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345 As many as 24 sample firms are producing made ups. Of them 21 firms belonging to E category3 belonging to D&E category. Six firms are producing only bedcovers. Many firms have recently diversified into made ups. 4 of the sample firms, earlier specializing in carpets, have diversified in made ups.
Though home textiles along with furnishing fabrics/upholstery material continue to be the main product categories produced in the cluster, there are a large number of new products with are added with in these broad categories in the post reform period. Moreover there are a large number of incremental changes, in the form of new finishes, made on same products to change their quality/characteristics.\textsuperscript{346} The cluster which used to export mostly stand alone items like bed covers, is now exporting coordinated ranges, such as bed room range and dining table range or bath room range, which are adopted by many exporters for value addition.\textsuperscript{347} Secondly, cluster has seen considerable change in its product mix in the last decade. The share of items which are produced for the export market, such as made ups, carpets and durries has gone up sharply. This has been made possible due to entry of new firms as well as due to considerable change in the product range by existing firms. Not only are the producers experimenting with new fabrics like silk and jute etc, they are trying traditional crafts like embroidery, tie and dye and patch work etc. to add value.

Durrie making has also seen some innovation in the post reform period.\textsuperscript{348} Variety of durries produced in Panipat includes Chindi durries, Punja durries, rope durries, embroidered durries and chenille durries.\textsuperscript{349} Most of these varieties have been introduced. Some incremental innovations introduced in durries include cut-shuttle durries, woolen jacquard durries, and embroidered, braided and berber rugs. One small firm has introduced printed durries in the year 2001.

Secondly, with fast growth of export demand 1990s Panipat has seen a surge in carpet manufacturing. The cluster has seen considerable innovation and quality improvement in this product category. Among carpets, main categories produced in Panipat are tufted carpets and

\textsuperscript{346} For example Panipat was producing considerable volume of bed covers for the domestic market in the pre-reform period. In the post reform period it has started producing wide width bed sheets made from fine count yarn. It has been made possible because of introduction of shuttle-less looms and facility for wide width fabric dyeing. This product innovation, though incremental, is an important development, because bed spreads are the home textile item for which the global demand is growing at the fastest rate.

\textsuperscript{347} Bed room range includes bed covers, bed sheets, pillowcases, cushions and curtains, and the dining table range including table covers, table napkins, table runners and table mats etc. The bathroom range includes towels and bath mats etc. Some firms have also introduced kitchen range with items like aprons and oven gloves etc.

\textsuperscript{348} As many as 26 of the sample firms reported manufacturing a very wide range of durries.

\textsuperscript{349} Chindi Durries are durries made from rags. Punja durries, often considered to be Panipat specialty, are woven on small and medium width looms. The weaver firmly rams down the weft with the help of a punja (heavy multi-pronged metal fork) to make the weave firmer and thicker and to make the bold coloured motifs stand out. Punja durries fetch higher price than the traditionally woven durries.

\textsuperscript{350} Chenille durries, which were introduced by Mahajan Overseas in 1998, could be considered as the current specialty of Panipat. The diffusion of chenille durries and other chenille items has been fast in the cluster.
woven carpets. Though tufted carpets were introduced in Panipat only in 1990, the cluster has become most important centre for tufted carpets. Almost all the tufted carpets made in the cluster are hand made. Hand tufted carpets are more versatile in design as compared to woven carpets. They also have greater flexibility in terms of size. Though some firms tried to make machine made tufted carpets, their attempts have not been very successful.

Carpet making units are experimenting with new materials like silk, leather, jute etc. Earlier low value carpets without backing were being exported from the cluster. Now several units are manufacturing carpets with latex and non-latex backing. Woven carpets are lighter in weight and fetch 10-15% lower price. One small firm claimed that it was the pioneer in manufacturing fibre filled cushions in the cluster.

Manufacturing of fine quality blankets woven on shuttle-less looms is another product innovation introduced in the cluster which is perhaps the biggest centre of shoddy wool and blankets made from shoddy wool in the whole world. Three of the sample firms reported producing fine quality blankets. One of them reported exporting high quality mink blankets. But the diffusion of fine quality blankets has not been fast.

Another important product innovation introduced in the cluster is production of terry towels, which was started in last five years. A big firm which used to operate only in the upper end of the domestic market has entered the export market only in 2000-01. It is producing terry towels exclusively for the export market. There is no diffusion of this item among other firms as yet.

Another firm, operating in the domestic as well the international market, has attempted to upgrade through product diversification, by entering in the RGM segment of textile industry in the year 2001.

Panipat does not have the type of inter firm division of labour in terms of product categories that is reported in some of the typical IDs. As one exporter observed, days of

351 While all the 13 sample firms exporting carpets, are exporting tufted carpets, as many as 8 are also exporting hand woven carpets.
352 One firm in the cluster has electronic tufting machine.
353 Though blankets made with shoddy wool can also be included in the category of home textiles, this project does not include the study. Panipat is perhaps the biggest centre of shoddy wool in the world. Shoddy industry in Panipat is such a big activity that it merits a separate study.
354 At the moment it is acting as a specialized sub-contractor for big brand like Raymonds and TNG.
specialization are over. Now every body has to gear up to supply every thing, depending on what is buyers' demand. 

There have been several product innovations taking place in the cluster. Nearly all the product changes taking place are demand driven. Some of these product innovations have been adopted at an astounding rate in the cluster. This has been made possible, among other things, due to the speed at which specialized services needed for the new product innovation crop up in the cluster. Product mix produced in Panipat is completely market driven and varies a lot from year to year. The capability to accommodate this variation at low cost is perhaps Panipat's biggest strength and gives it an edge over other clusters.

It is fascinating to understand the dynamics of product diversification by individual firms in a cluster like Panipat, where products can have very short life cycles. If a firm gets an order for new product range initially it may depends on sub-contracting units whose capacities are stretched to the limit, to meet these orders. But if the demand for the items promises to stay in long term, big units get the required in-house manufacturing facilities installed. If there is perception of continued big orders in long term, some big firms go on to install technologically which are superior to the existing facilities in the cluster, in order to get better quality. For example, four of the sample firms, who have recently diversified in made-ups, have no shuttle-less looms at present. They are getting the small requirement of fine fabric met from the specialized spinning units. But once they procure sufficiently big orders, for longer periods, they plan to install their own shuttle-less looms.

This process of acquiring new machines for being able to produce new products often results in incremental machine based innovation in the cluster; either through local manufacturing or purchase of new machines and equipment. One such example is bath mats, which were introduced in the cluster in the last ten years. Initially the orders for bath mats were limited and very few firms supplied them. Today the demand for this item in the export market is so much that, according to one exporter, Panipat will be busy for next fifteen years supplying bath mats in the international market. There is perpetual incremental innovation going on with bath mats which are produced in different materials and shapes, designs and quality. Some varieties require different type of equipment such as four needled Zuki machines needed for tufted bath mats. In the case of some big exporters it has led to significant machine based

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355 One of the exporters said that they even go the extent of procuring some items from other clusters. For example, they procure curtain rods from Moradabad, in order to be able to export a ready to use range of items.
change, like purchase of equipment for tumble wash. One big firm has got special dyeing and drying equipment made for manufacturing of tufted bath mats.

5.2.1.3 Raw Material Change

The main raw material used in the textile cluster is yarn. A very large variety of yarns made from of natural and man made fibers are used in the cluster. Yarns ranging from coarse woolen yarn to fine quality cotton yarn, synthetic yarn as well as several blended yarns are used and experimented with. For the items produced for the export market the main stay is cotton yarn, which is supplemented with other yarns.

As is usual, raw material change in Panipat is closely linked with product change. A large number of incremental product changes such as changes in the look or feel of the product are brought by experimenting with different type of yarns. Yarns which have been recently introduced, or seen fast diffusion in recent years in the cluster include fine count cotton yarn, chenille yarn, fancy yarn, fur yarn, multifold yarn, art silk yarn and cut yarn, and so on. Some of the firms have also experimented with unconventional material like jute, hemp, heissian etc. Some firms have recently started using long fiber, good quality ‘Mary’ wool imported from Turkmenistan in place of local wool, for making fine carpets. Firms producing exclusively for the domestic market have not experimented much with yarns. They mostly use polyester, acrylic and other synthetic yarns made from man made fibers, or they use various blends of cotton and synthetic yarns. Some of them have moved to finer count yarns.

Chenille yarn, which has seen very fast diffusion is now spun in Panipat. There exist specialized facilities for spinning of chenille, and a variety of other fancy yarns with natural fibers, which are made mostly on imported machines. Made from viscose and other natural fibers, chenille requires slightly modified machinery, which the cluster firms have been able to develop with the help of local machinery manufacturers. Many big firms now have in house facilities for making chenille yarn. While some of them use top of line imported machinery for his, several others are using locally fabricated equipment. This has lowered the cost and accelerated the rate of adoption of chenille yarn.

The most common act of change in the ancillary raw material is that of shifting from direct dyes to azo free reactive dyes. This has been undertaken by the exporters to conform to the environment friendly norms specified by German and other foreign buyers. Ten years back direct dyes were used extensively in the cluster. But due to the consideration of clean
technologies German and other buyers insisted on the use of eco-friendly azo free dyes. Since there were no azo free direct dyes available at that point of time, most of the exporters moved on to the azo free reactive dyes, which cost twice as much as the direct dyes. Today azo free direct dyes are available. But most of the exporters have not switched back to direct dyes. Fast diffusion of azo free reactive dyes in place of direct dyes has been facilitated by the presence of large number of stockiest of dye stuffs. However, direct dyes, which are cheaper than reactive dyes, continue to be used extensively for the products produced for the domestic market.

5.2.1.4 Technological Change: Evidence from the Firm Level Survey

The result of the survey undertaken to explore the type of technological changes introduced at the firm level in a sample of 45 firms is presented in Table 5.4. Out of a sample of 45 firms in the survey, 39 (86.6%) firms reported to have undertaken at least one technological change. All the six firms with zero level of technological change belong to the segment catering exclusively to the domestic market. Five of the six firms with no change were either very small or small. Majority of the sample firms however have undertaken very minor product or raw material change, such as introducing new type of durries, using finer count yarn or using azo-free dyes. Swift product change is one of the biggest strengths of the cluster. As many as 21 firms; 46.6% of all firms and 62% of the exporting firms, reported to have undertaken product changes. 12 firms, categorized as firms undertaking significant changes, have introduced product changes such as diversifying in into new product category or introducing a co-ordinate range. Two firms, both operating in the premium domestic market as well as in the export market, reported major product changes. One of them, a big firm with a turnover of Rs.125 crores, has diversified in production of terry towels and mink blankets which entailed a good deal of technological capabilities in accomplishing significant technological changes. Other firm, a medium sized firm with an annual turnover of Rs.50 crores is diversifying into garment processing and is a sub-contractor for premier garment companies such as Raymonds and TNG.

As many as 31 firms (68.8%) firms reported introducing new raw materials. Majority of them reported use of azo free reactive dyes in place of direct dyes or finer count yarn. They required no special process technological capabilities to introduce these raw material changes. Only six of the 31 sample firms reported the use of new fibers/fabrics.
TABLE 5.4 - Technological Change Introduced by Panipat Firms

<table>
<thead>
<tr>
<th>Type of Technological Change</th>
<th>Number of firms introducing Technological Change (N = 45)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Minor (N)</td>
</tr>
<tr>
<td>Product Changes</td>
<td>7 (15.5%)</td>
</tr>
<tr>
<td>Raw Material Changes</td>
<td>25 (55.5%)</td>
</tr>
<tr>
<td>Process/Machinery Changes</td>
<td>8 (17.7%)</td>
</tr>
<tr>
<td>At least One of the Above Changes</td>
<td>26 (57.7%)</td>
</tr>
</tbody>
</table>

Note: Values in parenthesis show the numbers in the cells as are percentage of total number of firms in the sample.

Importance of process change in Panipat is reflected in the firm level survey, which shows that as many as 32 firms (71.1%) reported either change in production process or purchase of new type of machinery. The most common purchase was that of Shuttle-less looms, which are required for weaving finer quality fabric. Twelve of the sample firms have introduced shuttle less looms in the last five years. Significant technological changes in the machinery and process related changes included introduction of (second hand) shuttle-less looms with electronic Jacquards by one firm, an expensive (costing rupees 5crores) bath mat manufacturing plant by a big firm, and introduction of stenter by a big firm and introduction of several electronic machines, such as electronic embroidery, electronic tufting and fabric checking machines by a medium size firm. Of the seven firms placed in the category of major changes, three have incurred considerable investment in the purchase of machinery such as spinning and dyeing plants. Five firms reported to have installed in-house CAD/CAM facility. Some firms reported purchase of electronic equipment for testing, such as equipment for measuring the strength of the fiber.

Firm Size and Innovative Activity of the Firm

There emerges considerable difference in the innovative behaviour of the firms belonging to different size groups. With one exception, the very small and the small units

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356 The criterion used for determining the size categories is the same as used in chapter IV. Firms with a turnover ≤ Rs. 2crores are placed in the 'very small' category. Firms with turnover more than Rs. 2 crores but less than Rs.10 crores are in the category of small firms. Firms with turnover more than Rs. 10 crores but less than Rs.50 crores are in the category of medium firms. Firms with turnover more than Rs. 50 are placed in the category of big firms.
are not in a position to introduce either significant or major changes. The main reason for this is that significant/major changes in product or process involve significant upgradation in the profile of the machinery and equipment, which, is out of reach for these firms. Secondly, most of the advanced technologies in activities like dyeing and finishing are scale intensive and therefore are not economically viable for small firms. Among the six firms having introduced significant changes, 3 belong to the medium category, while 2 are large firms. This suggests that the optimal size of the firm from the point of view of technological dynamism far exceeds the limit set by the official definition of a SSI unit. Though clustering makes it possible for relatively smaller firms to be technologically dynamic as compared to stand alone situation, even in a clustering context firms have to have a threshold size.

Small and very small firms however are good at introducing minor changes; specially minor product/raw material based changes. 68.7% of very small firms and 80% of small firms have introduced minor changes.

Biggest firms are not necessarily the most innovative firms in terms of introduction of major changes. While only two (16.7%) of the big firms reported introducing major changes, as many as the medium sized firms 5 (38.5%) have introduced major changes.

**TABLE 5.5 - Technological Change in Different Size Groups**

<table>
<thead>
<tr>
<th>Firm Size</th>
<th>Number of firms introducing Technological Change</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Minor (percentage)</td>
</tr>
<tr>
<td>Very Small</td>
<td>N=17</td>
</tr>
<tr>
<td>Small</td>
<td>N=10</td>
</tr>
<tr>
<td>Medium</td>
<td>N=12</td>
</tr>
<tr>
<td>Big</td>
<td>N=6</td>
</tr>
<tr>
<td>Total</td>
<td>N=45</td>
</tr>
</tbody>
</table>

Note: Values in parenthesis are percentages of row totals

One important finding in the Panipat case study is that there is **no linear relation between the firm size and the innovativeness of a firm**. Though the small firms may be constrained in the introduction of new technologies, medium sized firms are potentially as
innovative as the bigger firms. Not only is percentage of firms introducing major changes highest among the medium size category, (Table 5.5) a medium sized firm, is the most dynamic firm, not only among the sample firms, but perhaps among all the cluster firms. This suggests that firms don’t have to be very large for being technologically dynamic.

*Market Orientation and the Innovative Activity of the Firm*

There is only partial support for the hypothesis of strong and positive link between the market orientation of firms and their technological performance; though the firms catering exclusively to the domestic market do emerge as the least dynamic group, firms with 100% export intensity don’t form technologically the most dynamic group. The distinction of technologically the most dynamic group goes to (D&E) category; the firms catering to both the markets. (See Table 5.6).

**TABLE 5.6 - Market Orientation of Firms and Level of Technological Change**

<table>
<thead>
<tr>
<th>Markets</th>
<th>Number of firms introducing Technological Change</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Minor</td>
</tr>
<tr>
<td>Only Domestic Market (D)</td>
<td>N=13</td>
</tr>
<tr>
<td>Domestic and Exports (D&amp;E)</td>
<td>N=7</td>
</tr>
<tr>
<td>Only Exports Market (E)</td>
<td>N=25</td>
</tr>
<tr>
<td>Total</td>
<td>N=45</td>
</tr>
</tbody>
</table>

Note: Values in parenthesis show the numbers in the cells as are percentage of row total.

The units in D (Domestic) category have undertaken very few changes in process technologies. Very few units go far finishing of fabric. There is no testing done by them. Since the quality of their products continues to be poor, they are not in a position to enter global market. Though the profit margins in job work for exporters are almost double as compared to domestic market these firms, due to the poor quality of their products cant even take the risk of becoming suppliers to the exporters. Since the colour fastness and other specifications for exports items are more stringent, and rejection rates are higher, the small units, catering exclusively to the domestic market, experience difficulties in supplying to the exporters.

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357 It has an annual turnover of Rs.40 crores.
Among the sample firms only eight of the 13 (61.5%) domestic firms reported introduction of minor changes, none of them reported introducing any significant/major changes.

Since the D category firms are all small/very small, it could be argued that their poor technological performance is due to their small size rather than their market orientation. The possible corollary of this line of argument would be that once these firms attain the threshold size they will become technologically dynamic. This argument does not hold because none of the D category firms are new. In fact, as a group D category firms are the oldest firms in the cluster. They are, as a group, not in the growth phase. Majority of them are in the stagnation phase. Therefore it cannot be assumed that in future learning curve advantage will help them to improve their competitiveness. Lack of technological dynamism seems to be the cause rather than the effect of their small size, as well as for their inability to enter the global market.

The D&E category firms which have entered the global market after having catered to the upper end of the domestic market emerge as the most dynamic firms. Their technological dynamism seems the cause rather than the effect of their success in the global market. 358

On the whole evidence from Panipat does not show a linear relation between export intensity of a firm and its technological performance. Moreover, it clearly indicated presence of a feed back loop between two variables.

5.2.1.5 Information Technology Based Change

A large number of firms in the cluster make use of IT in varying degrees for functions such as storing information, management, marketing and designing. (Table 5.7) A large number of the firms are using some software for either for keeping accounts or some other data engineering activities. 359 Since as many as 36 (80%) of the sample firms had computers and E-mail facilities, it can be inferred that use if IT for functions like data storing and market search is quite high in Panipat firms.

However, as can be seen from Table 5.7 a significant number of firms in Panipat don’t use computers. Since all but one of the nine non-users is small/very small firms, it could be

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358 This evidence is in conformity with the evidence from the Ludhiana knitwear cluster, where prior participation in the upper end of the domestic market allowed the firms to successfully enter the challenging export markets in the Western Europe and the USA (See Tewari 1999).
359 13 firms, including two small firms reported using special software for keeping accounts some other data engineering activities.
inferred that very small SSI units either lack resources to buy computers or lack the capabilities to use them or both. Secondly since all the nine non user firms cater exclusively to the domestic market, a link between the participation in the global markets and the use of IT can be inferred. However the arrow of causation is not clear. Lack of capabilities of small forms to use IT may be one of the reasons for their inability to enter the export market. On the other hand, their non-participation in the challenging export market there may mean much weaker demand pull for them to make use of IT.

While the use of ICT is quite wide spread for communication, for management of accounts and for marketing activities, its use in manufacturing activities is very limited(See Table 5.7). As far as process technologies in manufacturing activities are concerned, the use of ICT technologies among the cluster firms is negligible. Equipment with electronic controls which is used by a few cluster firms includes automatic shuttle-less looms, computerized embroidery machine, computerized fabric checking machine and computer colour matching. But it’s only medium to big size firms which have some equipment with electronic controls. There is no evidence of firms sharing the micro-electronic equipment or soft-ware by the cluster firms. The evidence emerging from the firm level survey suggests that the use of IT in manufacturing processes is low. The evidence that all the units using ICT based technologies in manufacturing, though originally registered as SSI units, are no more small units supports the view that the ICT based electronic equipment is too expensive to be affordable or economically viable for SSI units to be used in manufacturing activities. It’s use requires a minimum threshold size.

One activity in the production chain in which the diffusion of micro-electronic tools (in the form of CAD/CAM) is found to be wide spread is designing. This has been made possible due to presence of market based specialized service providers. While several medium and big firms have their own CAD-CAM facility, many of the smaller firms avail the services of the design centers.

360 Only three of the sample firms are using ICT based machines in one or more stages of manufacturing. Of these three firms one medium size firm, with an annual TO of Rs40 crores, reported using. It is also using for quality control. Another medium size firm, with the TO of Rs.42 crores reported use of second hand, imported electronic jacquard looms. The third firm, a big firm with a TO of Rs.125 crores

361 As many as nine of the sample firms processed in house CAD/CAM facilities and used them for designing. All the nine firms belong to size category medium or big. In addition to this 7 firms reported using the facilities of the design centres located in the cluster.
TABLE 5.7- Use of ICT by Firms

<table>
<thead>
<tr>
<th>Activity</th>
<th>Number of Firms Using ICT</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Very Small</td>
</tr>
<tr>
<td></td>
<td>N=17</td>
</tr>
<tr>
<td>Designing</td>
<td>0 (0.0)</td>
</tr>
<tr>
<td>Manufacturing</td>
<td>0 (0.0)</td>
</tr>
<tr>
<td>Quality Control</td>
<td>0 (0.0)</td>
</tr>
<tr>
<td>Management</td>
<td>4 (23.5)</td>
</tr>
<tr>
<td>Marketing</td>
<td>9 (52.9)</td>
</tr>
<tr>
<td>E-mail</td>
<td>9 (52.9)</td>
</tr>
<tr>
<td>Website</td>
<td>0 (0.0)</td>
</tr>
<tr>
<td>Net Searching</td>
<td>1 (5.8)</td>
</tr>
<tr>
<td>Any Other</td>
<td>1 (5.8)</td>
</tr>
<tr>
<td>Using ICT in at least One Activity</td>
<td>9 (52.9)</td>
</tr>
</tbody>
</table>

Note: Values in parenthesis represents percentages of the column total

On the whole it can be said that there does exist some clustering advantage which has facilitated fast diffusion of ICT technologies in at least one stage of production.

5.2.2 Factors Initiating Technological Change: Demand Pull Versus Supply Push

While the fast growth of Panipat textile cluster in 1970s and to a lesser extent in 1980s can be termed as technology driven growth, the growth in 1990-91 onwards can be unambiguously termed as export led growth. The evidence from the meso as well as micro sources lends clear support to the hypothesis of the thesis is that the technological change in the last decade has been demand driven, rather than technology driven. Technological change of the post reform period are driven by demand pull brought about mainly by the provisions of trade policy, as against, the technology push exerted by the textile policy in the earlier decades.

Like Moradabad, Panipat has undergone considerable changes in its market orientation since 1990-91, and has emerge as a highly export oriented cluster. But unlike Moradabad, a considerable part of the total turnover of Panipat is still produced for the domestic market. While nearly 60% of its output is now being sold in the global market, about 40% is going in the domestic/local channel.
There are a large number of new countries which have joined the list of destinations for exports from Panipat in the post reform period, and the share of various countries in its exports has undergone a significant change. In the pre reform period the countries in the Western Europe were the main destinations for exports from the cluster. In the post reform years USA has emerged as the biggest market for the cluster. There are also several new destinations in Europe to which the products of the cluster are being exported.\textsuperscript{362}

Secondly, a large number of cluster firms are getting inserted in the global value chains through the buying agents.\textsuperscript{363} Consequently, there is significant change taking place with respect to the way marketing is organized. Many small exporters reported direct exports. Some of the firms also operate through network relations with small, independent retailers from USA and European countries. Big export units, on the other hand are operating through the buying agents in a big way. There is a whole range of value chains, with different opportunities.\textsuperscript{364} The share of direct exports by cluster firms has gone down, and the share of exports through buying agents, is on the increase. Though there is no exact data available, the general feeling is that the share of direct export, which used to dominate the cluster till recently, is no more than 40 today. In recent years the foreign buyers have been exerting their pressure through increased inspections at the premises of the exporters. This has also put pressure on exporters to introduce changes.

Among the units catering exclusively to the domestic market, almost all are operating through arms length market relations, rather than through commodity chains. While most of the small units in this category are operating in the lower end of the domestic market, among the medium sized and big units a good number is operating in the upper end of the domestic market. The more dynamic of the small firms aspire to enter the export markets. Many of them do succeed.

The desire of the small units, catering to domestic market, to move to more challenging export market, where rate of profits are higher, acts as an important pull factor. This forces the firms to introduce changes resulting in better quality products, which is seen as a precondition

\textsuperscript{362} The destinations of exports from the cluster include USA, Canada, Latin America, UK, France, Belgium, Italy, Spain, Yugoslavia, Portugal, Middle East and Australia and Morocco.

\textsuperscript{363} The important retail chains, for which the cluster firms are working as commercial sub-contractors are led by global giants like Ikea Wal-Mart, J.C. Penny, GAP, Pottery Barn, Target, Ikea, Nest, Mark and Spencer, Mohawk Crate, Barrel, Nest etc.

\textsuperscript{364} While for the buyers like Wal-Mart, who compete on the basis of volumes, the ratio of export price to retail price is 1:3, in the niche market this ratio can be 1:6 or more, which means that the item which is purchased for $1 from Panipat fetches a retail price of $6 or more. The common range is 1:4 or 1:5.
for entering the export market. This is also true for the suppliers (to exporters), who want to become exporters. Among the firms who are already exporting, desire to get inserted in the GCCs, by becoming commercial sub-contractors of global giants, exerts the pull for change. Finally, the firms already inserted in the GCCs are forced to bring about several changes at the instance of their foreign buyers.

Not all the technological dynamism in the cluster is export led. In contrast to the small firms, who are introducing technological changes in order to enter the export market, there are several technological dynamic units in the cluster which started exporting only after having acquired significant technological capabilities by serving in the premium segment of the domestic market for several decades. They continue to serve the premium segment of the domestic market even after entering the export market. These firms, unlike the majority of exporters from Panipat, are not catering to the bottom end of the global market.

Evidence from Firm Level Survey

Like Moradabad, in Panipat also, in firm level survey demand pull exerted by market, rather than supply push emerges as the main factor initiating technological change in the cluster in the post reform period. 38 of the 45 sample firms which have introduced some change, as many as 37 reported market competition to be one of the drivers of change. (See Table 5.9) Only one firm did not cite market pull to be one of the reasons. For 34 firms demand pull emerged as the main deriver and for as many as 30 firms stated demand pull to be the only deriver.

<table>
<thead>
<tr>
<th>Demand Pull: number of firms</th>
<th>Supply Push: number of firms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Only Demand Pull</td>
<td>30</td>
</tr>
<tr>
<td>Demand Pull Main Reason</td>
<td>33</td>
</tr>
<tr>
<td>Demand Pull Secondary Reason</td>
<td>4</td>
</tr>
<tr>
<td>All Firms Reporting Demand Pull</td>
<td>37</td>
</tr>
<tr>
<td>Only Supply Push</td>
<td>1</td>
</tr>
<tr>
<td>Supply Push Main Reason</td>
<td>4</td>
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<tr>
<td>Supply Push Secondary Factor</td>
<td>3</td>
</tr>
<tr>
<td>All Firms Reporting Supply Push</td>
<td>7</td>
</tr>
</tbody>
</table>

Note: Numbers in the cells represent number of firms.

Of the 7 firms reporting supply push as one of the derivers, only four reported supply push to be the main reason. Only one of these four firms reported supply push to be the only reason. (See Table 5.8) For this medium size firm with a turnover of Rs.40 crores, supply push was the only reason for technological change. This firm, the most dynamic of the sample firms,
caters to both the markets; domestic and international. It cited availability of cheap finance through TUFS to be the most important reason, and easy access to imported machinery as the second most important reason for introducing technological change.

Access to technological knowledge from the textile machinery exhibition at Delhi was cited as the most important reason for introducing change by one firm. This firm is a certified supplier of UNHCR (United Nations High Commission for Refugees), and has been supplying exclusively to UNHCR for several years. One small firm cited desire for exclusiveness to introduce new products by combining raw materials like jute and leather etc. This firm is engaged in network relation with some small and medium size European buyers, with whom it has a long term relation. Only one unit cited in-house creation of new knowledge by its product development division to be the primary reason for introducing product based innovations. This big firm is catering exclusively for the global market, mostly as the supplier in GVCs led by big giants.

Though the cluster has been on fast growth trajectory, and has experienced export boom in the post reform period, none of the firms reported availability of internal surplus as the main or even one of the reasons for introducing technological change. This shows that lack of finance has not been an effective constraint in the process of technological upgradation in the cluster.365

As in the case of Moradabad, as compared to new competition in terms of quality and delivery schedules, price competition emerges as far more important factor. As many as 30 of the 38 firms introducing changes stated price competition to be the prime reason. For 3 firms competition in quality and for one firm competition in the form of smaller delivery schedules emerged as the main factor for initiating change. However, in all 18 firms stated competition in quality to be one of the reasons for change.

Competition from international firms was stated to be the most important form of market pull for the firms catering to the global market; as many as 22 of the 12 firms catering to the global market reported competition from the international firms to be the main reason. Of these 22 firms, for 12 price competition from international firms and for 2 each, competition from domestic and local firms emerged to be the most compelling reason for introducing change.

365 This was supported by Mr. Dhavan, ex-incharge of NITRA Power-loom Service Centre, who said that lack of funds has never been a problem with Panipat entrepreneurs, who have enough internal funds to invest. In addition to this SIDBI and commercial banks are quite willing to fund upgradation projects of the firms.
While 3 of them reported competition in terms of quality to be the most compelling reason, for 14 of them it was second most important reason. (See Table 5.9)

Among the firms catering to both the markets, 3 reported price competition from the international firms to be the most compelling reason for introducing change, while one reported competition from local firms as the most important reason. For the remaining two supply push factors were most important factors.

5.2.3 Technological Capabilities of the Cluster

5.2.3.1 Firm Level Technological Capabilities of Panipat

A matrix showing various parameters considered for exploring technological capabilities at the firm level survey of 45 firms is shown in Table 5.10. There is very little in-house R&D taking place even in the biggest and most dynamic of the cluster firms, though some of them do have testing facilities. In spite of a developed sectoral system of innovation at the national level, which comprises of several university and other institutions having facilities for textile education, the number of technically qualified persons employed by the firms in Panipat was found to be low. More significantly only one entrepreneur; (owner of a very small firm), among the sample firms, had a degree in Textile Technology. Not surprisingly, this very small firm had the highest economic and technological dynamism within its own size category.

Of the total of 45, nine entrepreneurs fall in the category of attaining high educational qualifications of entrepreneurs. One of the entrepreneurs, owner of the most dynamic firm in its size category, has a degree in Textile Technology. As many as 24 entrepreneurs are graduates. Only 2 of the 45 entrepreneurs had no formal education, while 10 others had no higher education. All but one of the 12 entrepreneurs with low educational qualifications owned firms operating only in the stagnant domestic market. In fact low educational qualifications of the entrepreneurs were listed as one of the most important reasons for their poor performance by many of these entrepreneurs. While most of the exporting firms, and even the firms which were preparing to enter the export market had qualified entrepreneurs, there was one significant exception in this respect. A very big firm, with 100% export orientation is a partnership firm with both the partners having only High School qualification. But both the partners have had very long association with the industry in several capacities and have excellent hand-on knowledge in all the departments of firms operation from technology to marketing.
### TABLE 5.9 - Reasons for Introducing Change: Ranks

<table>
<thead>
<tr>
<th>Reason</th>
<th>Ranks: No. of Firms</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>I</td>
</tr>
<tr>
<td>Price competition</td>
<td>29</td>
</tr>
<tr>
<td>Price Competition I</td>
<td>12</td>
</tr>
<tr>
<td>Price Competition D</td>
<td>7</td>
</tr>
<tr>
<td>Price Competition L</td>
<td>10</td>
</tr>
<tr>
<td>Competition in Quality</td>
<td>3</td>
</tr>
<tr>
<td>Quality Competition I</td>
<td>2</td>
</tr>
<tr>
<td>Quality Competition D</td>
<td>0</td>
</tr>
<tr>
<td>Quality Competition L</td>
<td>0</td>
</tr>
<tr>
<td>Delivery Schedule</td>
<td>1</td>
</tr>
<tr>
<td>Delivery Schedule I</td>
<td>1</td>
</tr>
<tr>
<td>Delivery Schedule D</td>
<td>0</td>
</tr>
<tr>
<td>Delivery Schedule L</td>
<td>0</td>
</tr>
<tr>
<td>Access to Knowledge</td>
<td>2</td>
</tr>
<tr>
<td>Technological knowledge I</td>
<td>2</td>
</tr>
<tr>
<td>Technological knowledge D/L</td>
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</tr>
<tr>
<td>Technological knowledge In house</td>
<td>0</td>
</tr>
<tr>
<td>Easy Availability of Machinery I</td>
<td>1</td>
</tr>
<tr>
<td>Government Incentive</td>
<td>0</td>
</tr>
<tr>
<td>Any other</td>
<td>2</td>
</tr>
</tbody>
</table>

Note: Numbers in the cells in columns 2, 3 and 4 show number of firms giving the rank to the specified reason in column 1 for introducing technological change. Numbers in column 5 represent the number of all firms mentioning the specified reason in column 1. I=international, D=domestic, L=local

As far as the qualifications of the staff are concerned, though there are some technically qualified persons employed in the firms, their number is small. In our sample of 45 firms, there were less than 50 employees with a degree in technology or engineering and less than two dozens with a degree either in textile technology or design. This is surprising given the fact that Haryana has its own Textile Technology Institute in Bhiwani. There are however, a
more significant number of diploma holders in technology and design. Among the 124 diploma holders employed by the sample firms, as many as 60 had a diploma in textiles. Most of them came from various Handloom Technology Institutes located outside Haryana. As expected, none of the small firms catering exclusively to the domestic market had any technically qualified employee. Most of the qualified persons were engaged by the medium or the big units. But very few really attained formal technical qualifications and their proportion was small. But all the firms in the cluster do have the benefit of being able to employ persons with lot of practical experience and accumulated tacit knowledge which is seen to be playing an important part in building technological capabilities both at the firm level and hence at the cluster level.

Table 5.10 suggests that the firm level technological capabilities in Panipat, though moderate, are higher than those in Moradabad. Since, due to a strong network of educational institution in different parts of the country which impart education for textile technology, the availability of technical literature and technically qualified persons is good, Panipat firms are in opposition to enhance their technological capabilities by employing technically qualified persons. They also have access to relevant literature. Graduates from TIT (Textile Technology Institute) Bhiwani, and diploma holders from various handloom technology institutes are employed by several firms. Use of technical literature by the entrepreneurs/employees of the firms is not very uncommon. But, since most of the firms in the cluster are either small or medium sized, there is little or no provision for in-house R&D.

* in Table 5.10 indicates high level of educational qualifications of the entrepreneur and workers respectively. The level of all the components of technological capabilities of firms are assigned as per the specifications led down in Table 3.2
### TABLE 5.10 - Firm Level Technological Capabilities: Micro Picture

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Turnover (Rs. Lakhs)</th>
<th>Export Intensity</th>
<th>TCAPS</th>
<th>Education Level of the Entrepreneur</th>
<th>Education Levels Of Workers</th>
<th>Technological Support System</th>
<th>Sources of Technological Knowledge</th>
<th>Books and Journals</th>
<th>Competence in IT</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>18</td>
<td>0</td>
<td>L</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
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</tr>
<tr>
<td>2</td>
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<td>L</td>
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<td>0</td>
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<td>0</td>
</tr>
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<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>4</td>
<td>33</td>
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<td>L</td>
<td>HS</td>
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<td>0</td>
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</tr>
<tr>
<td>5</td>
<td>45</td>
<td>0</td>
<td>L</td>
<td>B.Com</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>6</td>
<td>80</td>
<td>0.4</td>
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<td>B.Tech</td>
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<td>0</td>
<td>H</td>
<td>M</td>
</tr>
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<td>7</td>
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<td>HS</td>
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<td>1</td>
<td>H</td>
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<td>4*</td>
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<td>H</td>
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</tr>
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<td>M</td>
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<td>M</td>
<td>M.Com*</td>
<td>1*</td>
<td>4</td>
<td>M</td>
<td>L</td>
<td>M</td>
</tr>
<tr>
<td>31</td>
<td>1500</td>
<td>1</td>
<td>L</td>
<td>B.Com*</td>
<td>1</td>
<td>2</td>
<td>M</td>
<td>0</td>
<td>M</td>
</tr>
<tr>
<td>32</td>
<td>2000</td>
<td>1</td>
<td>H</td>
<td>MA*</td>
<td>3*</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>H</td>
</tr>
<tr>
<td>33</td>
<td>2400</td>
<td>1</td>
<td>M</td>
<td>B.Com</td>
<td>13*</td>
<td>0</td>
<td>M</td>
<td>0</td>
<td>M</td>
</tr>
<tr>
<td>34</td>
<td>2500</td>
<td>1</td>
<td>M</td>
<td>BA</td>
<td>21*</td>
<td>19</td>
<td>M</td>
<td>0</td>
<td>H</td>
</tr>
<tr>
<td>35</td>
<td>3500</td>
<td>1</td>
<td>H</td>
<td>BA,LLB*</td>
<td>18</td>
<td>1</td>
<td>M</td>
<td>H</td>
<td>M</td>
</tr>
<tr>
<td>36</td>
<td>3500</td>
<td>1</td>
<td>H</td>
<td>HS</td>
<td>18*</td>
<td>3</td>
<td>H</td>
<td>0</td>
<td>M</td>
</tr>
<tr>
<td>37</td>
<td>4000</td>
<td>0.75</td>
<td>H</td>
<td>B.Com</td>
<td>20*</td>
<td>30</td>
<td>H</td>
<td>H</td>
<td>H</td>
</tr>
<tr>
<td>38</td>
<td>4200</td>
<td>1</td>
<td>H</td>
<td>B.Com</td>
<td>11*</td>
<td>10</td>
<td>H</td>
<td>H</td>
<td>H</td>
</tr>
<tr>
<td>39</td>
<td>5000</td>
<td>1</td>
<td>M</td>
<td>M.Sc.*</td>
<td>130*</td>
<td>5</td>
<td>M</td>
<td>0</td>
<td>M</td>
</tr>
<tr>
<td>40</td>
<td>5000</td>
<td>1</td>
<td>H</td>
<td>HS</td>
<td>156*</td>
<td>4</td>
<td>H</td>
<td>0</td>
<td>H</td>
</tr>
<tr>
<td>41</td>
<td>5000</td>
<td>1</td>
<td>H</td>
<td>B.Com</td>
<td>27</td>
<td>17</td>
<td>M</td>
<td>0</td>
<td>H</td>
</tr>
<tr>
<td>42</td>
<td>5000</td>
<td>1</td>
<td>H</td>
<td>B.Com</td>
<td>114*</td>
<td>2</td>
<td>M</td>
<td>0</td>
<td>H</td>
</tr>
<tr>
<td>43</td>
<td>100,00</td>
<td>1</td>
<td>M</td>
<td>BA</td>
<td>95*</td>
<td>3</td>
<td>H</td>
<td>0</td>
<td>M</td>
</tr>
<tr>
<td>44</td>
<td>125,00</td>
<td>0.4</td>
<td>H</td>
<td>BA</td>
<td>95*</td>
<td>3</td>
<td>H</td>
<td>0</td>
<td>M</td>
</tr>
<tr>
<td>45</td>
<td>12500</td>
<td>1</td>
<td>H</td>
<td>B.Sc</td>
<td>90*</td>
<td>18</td>
<td>H</td>
<td>H</td>
<td>H</td>
</tr>
</tbody>
</table>
TABLE 5.11- Educational Levels and Technical Support in Firms

<table>
<thead>
<tr>
<th>Parameters of Technological Capabilities</th>
<th>Number of firms</th>
<th>N=45</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>None</td>
<td>Low</td>
</tr>
<tr>
<td>Qualification of the Entrepreneur</td>
<td>-</td>
<td>12  (26.6)</td>
</tr>
<tr>
<td>Qualification of the Staff*</td>
<td>-</td>
<td>12  (26.6)</td>
</tr>
<tr>
<td>R&amp;D/Design Facility</td>
<td>25   (55.5)</td>
<td>0   (0.0)</td>
</tr>
<tr>
<td>Training</td>
<td>38   (84.4)</td>
<td>1   (2.2)</td>
</tr>
<tr>
<td>Consultation of Books and Journal</td>
<td>26   (57.7)</td>
<td>0   (0.0)</td>
</tr>
<tr>
<td>Competency in use of IT</td>
<td>8    (17.7)</td>
<td>7   (15.5)</td>
</tr>
<tr>
<td>Level of Tcaps</td>
<td>-</td>
<td>24  (53.3)</td>
</tr>
</tbody>
</table>

Note: Numbers in the parenthesis show percentages.

Technological capabilities of firms are a dynamic resource which can grow if built up consciously, or can deplete if neglected. Therefore updating the technological knowledge base and upgrading skills of both the managers and workers to meet the requirements of newly emerging technologies is very important. **Very few firms** in the cluster had any provision for continued up-gradation of the staff through **training and consultation of books and journals**. While 7 of the sample firms, all medium/big, reported having some provision of training, most of it was occasional, in the form of sending managerial staff for seminars. In all five firms reported consulting technical books. 15 more procured one or more journals on a regular basis. While some of these books and journals were for market intelligence many firms reported consulting technical literature.

The survey of firms revealed that there is very little in-house research activity taking place in the cluster, though a few firms did have testing facilities. However, some of the medium size and big firms do have considerable design capabilities as shown in Table 5.12. All the firms with R&D or design facilities were catering to the export market, either wholly, or partially. The percentage of medium and big firms with separate R&D/Design divisions was also nearly same.
TABLE 5.12 - In-house Research & Development and Design Facilities

<table>
<thead>
<tr>
<th>Firm Size</th>
<th>Only R&amp;D</th>
<th>Only Design</th>
<th>R&amp;D and Design</th>
<th>Either R&amp;D or Design</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very Small N=17</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0 (0)</td>
</tr>
<tr>
<td>Small N=10</td>
<td>1</td>
<td>0</td>
<td>2</td>
<td>3 (30)</td>
</tr>
<tr>
<td>Medium N=12</td>
<td>2</td>
<td>2</td>
<td>6</td>
<td>10 (83.3)</td>
</tr>
<tr>
<td>Big N=6</td>
<td>0</td>
<td>4</td>
<td>2</td>
<td>6 (100)</td>
</tr>
<tr>
<td>Total N=45</td>
<td>3</td>
<td>6</td>
<td>10</td>
<td>19 (42.2)</td>
</tr>
</tbody>
</table>

The numbers in the cells indicate the number of firms.
Numbers in parenthesis indicate percentage of row total

Firms Size and Technology Capabilities of the firms

Distribution of firms in different size groups with respect to the level of overall technological capabilities of firms in each firm, seen as a composite index of intra firm technological capabilities is presented in Table 5.13.

TABLE 5.13 - Level of Technological Capabilities in Different Size Groups

<table>
<thead>
<tr>
<th></th>
<th>Low</th>
<th>Medium</th>
<th>High</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very Small N=17</td>
<td>16 (94.1)</td>
<td>1 (5.8)</td>
<td>0 (0.0)</td>
</tr>
<tr>
<td>Small N=10</td>
<td>6 (60.0)</td>
<td>3 (30.0)</td>
<td>1 (10.0)</td>
</tr>
<tr>
<td>Medium N=12</td>
<td>2 (16.6)</td>
<td>4 (33.3)</td>
<td>6 (50.0)</td>
</tr>
<tr>
<td>Big N=6</td>
<td>0 (0.0)</td>
<td>3 (50.0)</td>
<td>3 (50.0)</td>
</tr>
<tr>
<td>Total N=45</td>
<td>24 (53.3)</td>
<td>11 (24.4)</td>
<td>10 (22.2)</td>
</tr>
</tbody>
</table>

The numbers in the cells indicate the number of firms.
Numbers in parenthesis indicate percentage of row totals

As expected, there emerges a clear link between the firm size and the firm level technological capabilities. Technological capabilities of all but one, (94.1%) 'very small' firms were low, where as none of the big or medium firms, barring one, had low level of technological capabilities. Conversely, of the eight firms with high level of technological capabilities, seven were either medium or big. Though the positive link between the firm size and the technological capabilities of the firms is present through out, the link is non linear. The difference between the

366 Detail of the index is provided in Table 3.3 chapter III, giving the matrix of parameters used for accessing the technological capabilities of the firms.
technological capabilities of the medium and big firms does not emerge to be as significant as that between small and medium size firms. Among the sample firms, the firm with the highest technological capabilities, which was also the most innovative firm in the sample, was a medium size firm, with an annual turnover of Rs. 40 crores.

**Market Orientation and Technological Capabilities of Firms**

There is a significant variation in the technological capabilities of the firms catering to different market channels. The firms catering to both the markets, domestic and export, emerged as the most dynamic group in terms of the level of technological capabilities, followed by firms catering only to the export market. (See table 5.14)

**TABLE 5.14 - Market Orientation and Technological Capabilities of Firms (N = 45)**

<table>
<thead>
<tr>
<th>Market Orientation</th>
<th>Level of Technological Capabilities</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Low (100)</td>
</tr>
<tr>
<td>Domestic (D) N=13</td>
<td>13 (100)</td>
</tr>
<tr>
<td>Domestic and Export (D&amp;E)N=7</td>
<td>2 (28.6)</td>
</tr>
<tr>
<td>Exports (E) N=25</td>
<td>9 (36)</td>
</tr>
<tr>
<td>Total N=45</td>
<td>24 (53.3)</td>
</tr>
</tbody>
</table>

Values in parenthesis indicate percentage of row totals

Technological capabilities of all the firms catering exclusively to the domestic market are very low. However, not all the firms catering exclusively to the global markets have high technological capabilities. Out of 25 firms which have 100% export orientation, as many as 8 have low technological capabilities. On the other hand, two of the seven sample firms operating both in the domestic and global market have very high level of technological capabilities. They are in fact the most dynamic of the sample firms. These firms, operating in the upper end of the domestic market, have contributed significantly to the cluster's dynamism and have been pioneers in their own right, in terms of introducing new products and product range. One of these firms which has entered the export market only recently, has ventured into manufacturing of upper end terry towels, which require higher levels of technological competence as compared to most other products exported from the cluster. This firm sells 60% of its output in the domestic market. Another pioneer, a medium size firm, and arguably the most technologically savvy firm in the cluster are ready to venture in the more challenging market of apparel wear.
In fact it has already made a beginning by working as a sub-contractor for one of the country’s leading garment manufacturers. Firms like this can be seen as potential technological leaders which can initiate the process of diversification of the cluster in more challenging, high value products. The example of these two firms suggests that the firms which have acquired significant technological capabilities before entering the export market, by catering to the upper end of the domestic market are likely to participate more successfully in the global market.

5.2.3.2 Cluster Level Technological Capabilities

Cluster level technological capabilities in varying ways are associated with the local public and private agencies, knowledge and training institutions which are likely to provide various forms of support and get involved in the diffusion and mediation of technological and other relevant knowledge. They are parts of the knowledge system of the cluster.

Educational and Technological Infrastructure

As far as the educational infrastructure of the district is concerned, it offers no special boost to the technological capabilities of the cluster. Though, as per 2001 census, the literacy rate in Panipat, at 76.45%, is higher than the national average as well as the average rate in the state of Haryana, it does not contribute significantly towards the technological capabilities of the cluster. The reason for this is that in spite of higher literacy rate of the district, a high portion of the workforce in the textile industry, which comprises of migrant workers, is illiterate.

The district has no university. Though it has six colleges, none of them offer degree in technology or in engineering but some of them do offer degrees in science. The city of Panipat has one ITI (Industrial Technology Institute) but it does not offer any course in textile technology, or in a related field. As a result, there is no scope for innovation resulting from interaction between knowledge institutions and the industry. There are few qualified persons who are endowed with the industry specific technological knowledge.\(^\text{367}\)

Panipat does not have any national level or state level technological or R&D institution. Nor does it have any significant facility like National Institute of Handloom Technology or a branch of the National Institute of Fashion Technology for the creation of skills and training of the workers or supervisory staff. But the cluster does have several minor, sectoral facilities set up by various agencies of Ministry of Textiles which have contributed to the building of the technological capabilities of the cluster.

\(^{367}\) Technically qualified persons are migrants, coming from different parts of the country, like Delhi, Bombay and some from even down South. Several degree/diploma holders from textiles institute, TIT located in the neighbouring city of Bhivani are employed in Panipat. The cluster also draws diploma holders from NIFT, Delhi, IHLT, Varanasi, and NID, Ahmedabad.
NITRA Power-Loom Service Centre

NITRA Power-Loom Service Centre, one of the nine centers setup by NITRA (North Indian Textile Research Institute), is an important facility set-up by the Ministry of Textiles to promote the growth of the power-loom sub-sector of the industry. The mandate of the centre, which was set up in the year, is to provide the following services; (i) Conducting short term training programmes for weaving on Jacquard and Dobby looms, and for CAD(Computer Aided Designs), (ii) Providing facilities for physical, chemical and eco testing of fibers, fabrics and carpet, and (iii) Providing consultancy in the field of quality certification, energy conservation and effluent treatment.

Of the three main functions, it is only in the field of training that the NITRA centre has made some contribution, CAD training being its most important contribution. It has trained more than 150 persons over years. Many of them have gone on to start their own CAD centers, which cater to the needs of smaller firms of the cluster.

Though the centre does carry out limited testing activity, but since NITRA labs are not accredited by NABL There test reports are unacceptable to most of the foreign buyers. So the cluster firms depend largely on private firms like SGS, located in Delhi for testing facilities. Consultancy services provided by the centre are negligible.

Even as the output and exports from Panipat have been growing at a fast rate in the post globalization period, the role of the centre is decreasing. The centre, which is housed in a dilapidated building, has not had a permanent in-charge for quite some time. It has it been able to generate enough funds to upgrade itself and keep up with the changing requirements of the cluster. About Rs. 11 lakhs, which the centre gets as grant from the government are not enough for its functioning. So tight is the financial position that some employees have to go to the court for getting their dues.368

The Weaver Service Centre (WSC)

WSC in Panipat is one of the 24 centers set up all over India by the office of Development Commissioner of Handicrafts, Ministry of Textiles, to provide technical services to handloom weavers. It has facilities like design section, weaving section, processing and printing section and library and documentation system. The functions of WSC include training

368 According to one employee, the funds available to the centre are so meager that it has not been able to give 5th Pay Commission scales to its employees.
the weavers, development of designs, and boost marketing of the handloom products. WSC are also expected to provide free consultancy services, and solving the technical problems of the weavers.

The WSC at Panipat has played minor role in the technological upgradation of the cluster. The main reason for this, according to the MD of the centre, is that almost all the grant of Rs.5 millions per annum is spent on salaries. Little is left for development fund. Though the centre has started charging a small fee for its services, the amount so collected is just about 2% of its total budget. According to the director, due to the bureaucratic constraints the institute is unable to market itself aggressively. On the other hand, firms in the cluster are used to getting services provided by government agencies free of cost and are unwilling to pay good price for them. There is no attempt at adopting best practices in any activity. So the cost effectiveness of various activities is quite unsatisfactory. For example, the centre which has 35 employees is training not more than 70 persons annually. According to the director of the centre, the effectiveness of various programmes is diluted due to bureaucratic rigidities which result in enormous delays in implementation of any decision. One example given by him was that of CAD/CAM facility, which the centre could acquire only after a couple of years after it was bought by some firms in the cluster. Secondly, due to secrecy reasons, the bigger firms of the cluster are not interested in networking with the government facility like WSC. So much so that the representatives of the centre find it very difficult even to gain entry at the premises of the exporters. It is difficult for WSC or any other government agency to work as a network agency.

**NHDC Panipat Branch**

The main function of NHDC (National Handloom Development Corporation), also set up by the Ministry of Textiles, is to procure good quality yarn from all over India and make it available, especially to small handloom units, at a reasonable price. It also supplies dyes and chemicals to these units, and conducts training programmes in dyeing, with the help of experts from IIT, Delhi and other institutions. It also conducts training in use of new technologies on the premises of the manufacturing firms. Though marketing activities like supplying of handloom products to government offices and managing marketing complex for handlooms is also a part of the NHDC mandate, Panipat branch is yet to make any significant impact on the cluster.

The role of NHDC is also on the decline in the post reform period. This is mainly so due to the withdrawal of yarn subsidy. Most of the firms are disinclined to buy yarn from it for various reasons. Firstly, the firms in Panipat are using a variety of yams and blends, which
NHDC does not stock. Secondly, the blend of the yarn used by a firm is a trade secret, which may leak if it buys yarn from NHDC. Thirdly, small firms buy yarn against credit or against cash generated in hawala transactions. Its other functions are near non-starters.

Regional Office of Textile Committee, Panipat

Till recently the main function of the office of the Textile Committee, working under the Textile Commissioner, was to issue certificates to handloom goods meant for exports. With the end of MFA in sight, its function as a certifying agency has becoming redundant. Therefore in recent years, the office of Textile Committee in Panipat has concentrating on several promotional activities. Since 2002 it has been acting as the main networking agency for the CDP (Cluster Development Programme), which was initiated by UNIDO with the assistance from the MoT (Ministry of Textile).

The city has Quality Marketing Centre for Textile Goods, set up by the ministry, which provides facilities for yarn and fabric testing.

In addition to these government agencies, there are certain players in the private sector such as Tex Institute of Textiles, National Institute of Fashion Design, IB Institute of design, IEC School of Arts and fashion imparting sector specific education. There are also some private testing facilities in the cluster, like Richa Laboratory which offers some testing and consultancy services, and a collection centre of Delhi based SGS laboratory.

Even though there are a number of government sponsored institutions in the cluster, they are yet to create a significant impact. This point emerged quite clearly in the course of visits and discussions held with various personnel in these agencies. Evidence of the limited role of these facilities in the process of technological upgradation of the cluster also emerged from the firm level survey and interviews conducted with personnel in the firms. The number of survey firms which claimed benefiting from these above institutions is as follows: 13 of the sample firms reported benefiting from NITRA; 8 firms from WSC; and 3 firms from NHDC; and 1 from the Textile Committee. Not surprisingly, only four of our sample firms thought that availability of good technical services is an important strengths of the cluster. Though some of these institutions may have played significant role in the past, their role seems rather limited at this

369 Various cluster activities and programmes undertaken by the CDP so far include; Promoting networking among cluster actors through trust building measures between various trade associations and also by facilitating formation of TEAM (Textile Exporters and Manufacturers), promoting networking between the cluster agents and the outside cluster agencies such as SIDBI, NIFT, SGS etc, carrying out Technical gap analysis with the help of SGS, Pearl Academy, organizing workshops for various marketing and technological activities and arranging training for activities like SPC and inventory management etc.
point of time. This point emerged in interviews with the MD of the WSC and Mr. Dhavan, ex in-charge of NITRA Power-loom Service Centre.

Most of these public sector institutions are suffering from the aftermaths of liberalization. Not only have their funds dried up, the new policy paradigm has created existential problems for them by creating confusion about their objectives and their finances. Unable to evolve in synchronization with the requirements of the new policy environment they are suffering from inefficiency at several levels. It will however be unfair to suggest that all these institutions share the specter of becoming irrelevant. As mentioned earlier, some of them are trying to redefine themselves in the new context and may emerge as important actors in facilitating the cluster in acquiring long term dynamism. For example, the Office of Textile Committee faced the specter of near redundancy in the post MFA era. But by being picked up as the link agency for the CDP initiated with the help of UNIDO, it is in the process of resurrecting itself. It is still too early for assessing its impact in its new role. It is difficult to predict whether it will emerge as the technological gate-keeper of the cluster in due course of time. At the moment, the range of its activities seems too diffused to allow it to focus on building of technological capabilities of the cluster.

Physical Infrastructure

Being located in the vicinity of the national capital and being on the national high way gives the cluster an advantage in terms of physical infrastructure. The thermal power station located in the city of Panipat is instrumental in making Haryana a power surplus state. The district has four industrial areas developed by the state government; Industrial Area of Panipat (with 235 plots), Sector 25, HUDA (with 162 plots), Sector 29, HUDA (with 277 plots) and HSIDC, Samalkha (with 77 plots). The city of Panipat has an inland container depot. The National Informatics Centre (NIC) has set up NITPU (National Technology Promotion Unit) in 1997 to facilitate electronic communication /information for exporters and other users.

All these facilities notwithstanding, inadequate physical infrastructure of the cluster can be seen as one of the hindrances in its technological upgradation. In spite of the power surplus status of the state of Haryana, non availability of continuous power supply is one of the biggest problems faced by all the industry in Panipat. Not only is the provision of subsidy to new industrial units, introduced in 1997 by the state government, withdrawn, the industry does not get adequate power supply. As a result most of the big units have installed generators. Not surprisingly, 9 of the sample firms reported non-availability of power to be the biggest hitch in the process of technological upgradation. The condition of roads with in the city is also very unsatisfactory.

Traditional Skills
Specialized traditional skills do have a tendency to get localized. In many of the clusters in the traditional sectors, including metal art ware cluster of Moradabad, traditional, artistic skills of the local workers lend the cluster its identity. But accumulated traditional skills and tacit knowledge is not very high among local workers in Panipat. Nor are they known for their specialized artistic skills. Their only specialty seems to be heavy fabric weaving. One reason for this is that, unlike Moradabad and hundreds of other Indian clusters, which have existed for centuries, Panipat is comparatively young cluster. Secondly, and perhaps more importantly, most of the workers in Panipat are migrant labour from Eastern UP, Bihar and Bengal, who go back to their native states almost every year, and may or may not come back the next season. Since there is little continuity in their work, the scope for accumulation of tacit knowledge is limited, does not manifest itself in very artistic forms. Though there have been initiatives in the form of training programmes for weavers by Weavers’ Co-operatives and WSC, they have not resulted in the development of cluster specific artistic skills.

This does not however mean that the tacit knowledge technical skills of the weavers has no role to play in the competitiveness of the cluster. Most of the migrant weavers have learnt their skills in their native states. Their experience is a big asset for Panipat. According to experts, though learning curve for simple weaving is small, the productivity gains which come with experience are enormous. According to Mr. Aggarwal, owner of an export house, the productivity of an experienced skilled weavers may be three times as high as those of the inexperienced weavers. Panipat has a large number of very experienced masters, who, apart from being good managers of labour, are also equipped with special problem solving skills. They scout and bring good workers from their home states, as they are knowledgeable about their experience.

Over the years Panipat is accumulating considerable skills in the making of hand made tufted carpets, which is fast becoming the specialty of the cluster.

Panipat has significant capabilities for fabric designing, specially in jacquard designs, which have accumulated over several decades. According to Prof. Ishtiaque Panipat designers are so talented that they can develop any design you show them. Mastery in woven designs is the strength of North Indian textile sector in general and of Panipat in particular. In contrast to South Indian clusters, which are very good at stripes and checks, designers in Panipat can easily produce most complicated floral and other curvaceous designs. In the past the NITRA PLC and WSC have played some role in the promotion of design skills in the cluster. Not only do they have design development facilities, which are used for creation of new designs, NITRA centre

370 This is common in several clusters in textiles. Clusters like Sanganer in Rajasthan, Pochampalli in Andhra, Ikkat in Orissa, Kanchipuram in Tamil Nadu, Banares in UP and many more are defined in terms of special craft of the local workers.

371 This is why *punja durries* and tufted carpets, which are associated with Panipat, do not have an exclusive Panipat stamp.

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also conducts courses for training in CAD-CAM. The upgradation capabilities of the cluster are enhanced by the presence of 80 design centers, of which five have CAD-CAM facility. Though at present these centers are mostly helping in creation of designs provided by the buyers, they have a potential for facilitating functional upgradation of the cluster in the future through design autonomy.

One the whole, the cluster level technological capabilities of Panipat are moderate. Though the cluster has some technological infrastructure which is adequate in creating technological capabilities for supporting the fast growth of the cluster based on high volumes of exports, it is grossly inadequate for building up of capabilities which will promote the long term dynamism of the cluster based on significant technological and functional upgradation.

**Technological Capabilities of the cluster: Role of the Entrepreneur**

The entrepreneurial class in Panipat can be divided in three broad categories; The traditional entrepreneurs, belonging to the migrant Hyderabadi or Punjabi communities, who came to Panipat around the time of partition, entrepreneurs belonging to the trading community, whose families have lived in Panipat or other parts of Haryana before the partition, and the emerging entrepreneurial class with agrarian background.

In addition to this there is an important group of entrepreneurs who migrants from Rajasthan. The community has demonstrated very considerable entrepreneurial capabilities. Today Paliwals are perhaps the best known industrial clan in the cluster. They have considerable control on the production chain in the cluster.

*Hyderabadi* entrepreneurs have played very significant role in the formation and growth of the cluster in the past. They have been responsible for the power loom and synthetic yarn revolution brought in the cluster in 1970s and 1980s. At present while some of the biggest and most dynamic firms are owned by them, their number as a percentage of total number of entrepreneurs has been going down. A large number of entrepreneurs belong to this community, who own small firms catering to domestic market, emerges as the least dynamic and least technologically savvy group. They have introduced little change in product and process

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372 They own 25 manufacturing units and 8 export houses in Panipat, and are responsible for exports worth Rs. 500-600 crores.

373 Though not all the firms catering exclusively to the domestic market are owned by the members of the *Hyderabadi* community the overlap between two groups is significant enough to justify referring them in interchangeable manner. Secondly, though firms confined to domestic markets are less dynamic, there are some remarkable exceptions.
technologies in last 10 years. Two main reasons for their lack of dynamism are their lack of education, and path dependency.\textsuperscript{374} However, not all the \textit{Hyderabadi} entrepreneurs have remained small. In fact some of the best known names, associated with most dynamic units in the industry are from this community.\textsuperscript{375}

The entrepreneurial class belonging to trading community (of settlers) has come into prominence more recently. After having lagged behind the migrant community for several decades, now they are almost on par with them in terms of control on the value chain. They have done exceedingly well during the post 1991 period and increased their share in the fast growing exports. They are good at risk taking and entering new markets. They are also good at making market based networks and are able to make best use of the flexible and decentralized nature of the production system in Panipat. On an average this category of entrepreneurs has the best educational background.\textsuperscript{376} Some of the entrepreneurs belonging to the trading community are enthusiastic about education and are actively associated with the promotion of educational institutions. Some of them are interested in stating an institute for Textile Technology in the city for training people for the industry, but there is no concrete initiative. According to one entrepreneur, with a Ph.D. degree, who is associated with educational institutions, says he is prepared to invest in a technology institute. But he does not find the social environment conducive for it.\textsuperscript{377}

In addition to this there is the emerging class of \textit{Jat} entrepreneurs in the cluster. They own large number of small enterprises, located mostly in the semi-urban areas of the district, which they have started with the surplus generated in the agrarian activity. Most of them are engaged in the manufacturing and exports of durries and carpets, for which the core activity, weaving is done in the sheds located in semi-rural areas. Many of these entrepreneurs have

\textsuperscript{374} According to Banga, ex secretary of the association, and a member of the community, the biggest problem in technological upgradation among the units catering to domestic market is the low level of education among the entrepreneurs. According to a \textit{Hyderabadi} entrepreneur operating exclusively in the domestic market, 'Unlike the trading community we lack knowledge and also the confidence to take risk. Our strength is traditional manufacturing skills. But we lack business instinct'. One of the entrepreneur said, "We want to leave the industry. But don't know any alternative. We are not very educated. Moreover so much of money is sunk in the trade that it is not possible for us to quit."

\textsuperscript{375} Among them are Chughs of Golden International, and Chughs of Sheena, Bajaj and Dayal and many more. Mahajan Overseas, technologically the most dynamic among our sample firms and arguably the most technologically savvy firm in the whole cluster is owned by the family which migrated from Pakistan at the time of Partition.

\textsuperscript{376} Two of the entrepreneur among the sample firms who belonged to the trading community, were actively associated with Educational societies in the cluster.

\textsuperscript{377} Since then a degree college for Textile Technology has been opened in Panipat at private initiative.
maintained some links with agricultural activity. Apart from exporters there are a large number of Jat suppliers to exporters, who are also trying to emerge as exporters.

One trait shared by all the category of entrepreneurs is their capacity to work hard. According to Jain, a big exporter, hard work and tenacity to believe that they can do anything is the strong point of entrepreneurs in Panipat, who are ready to take risk and work on very small margins. According to Aggarwal, both the entrepreneurs and the workers of Panipat are very hard working and are very ambitious. It is the entrepreneurial spirit of the cluster and their strong profit motive which is the driving force behind the smooth functioning of economic links and high level of earned trust. This is particularly true of entrepreneurs belonging to the trading community. According to Mr. Saini, NITRA in-charge, “Their entrepreneurial spirit and their jugaru attitude; the confidence that we can do it prompts them to push the envelope. They often accept big orders which are far beyond their in-house capacity and are able to fulfill them at great speed at incredibly low price.” According to Chavan the biggest asset of Panipat is the ability of its entrepreneurs is its jugaru capabilities; to somehow manage.

But a large of entrepreneurs in Panipat follow low road strategies, like tax evasion, and theft of electricity for their survival and are not ready to spend their surplus on innovation and technological upgradation. Though a large number of entrepreneurs make use of institutional credit, very few borrow for technological upgradation.

5.2.3.3 Technological Capabilities in Inter-Cluster Links

Panipat, like several other developing country clusters, has little evidence of high level of social capital and ascribed trust. The dynamism of the cluster can be attributed more to the individual traits rather than to co-operation and collective efficiency. In recent years, with greater and greater integration with the global market, the culture of secrecy and mistrust has gained currency. Poaching of clients of rival firms through unfair means is not uncommon. Some exporters use all the tricks in their bag to attract rivals’ foreign buyers, such as cutthroat price competition and passing off the rivals’ designs as their own. According to one exporter

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378 According to an expert, who has been consultant to some big units in Panipat, the Panipat industry thrives on malpractices. Wide scale tax evasion of excise and other taxes is the norm in the cluster. There is massive under-invoicing of turnover in order to save tax. A significant part of power-loom exports go under the name of handloom, as handloom items are exempt from the provisions of MFA. According to him since power is virtually free for a large number of units there is little incentive for lowering cost through energy audit or process optimization.

379 According to Chauhan some exporters would bribe the postman with as much as Rs.500 in order to get the address on the letter received by a rival from any foreign location.
presence of buying agents has increased the corruption levels and ruined the culture of the cluster.

In conformity with the experience of several other developing country clusters, this case study demonstrated weak role of horizontal ties in the process of innovation in Panipat. However, there does emerge strong evidence of the important role played by the intra cluster vertical links in boosting the process of technological change in Panipat. The case study shows that the main source of technological learning in Panipat cluster is learning by interacting, which is made possible by the presence of extensive forward and backward links of the production and a very considerable inter-firm division of labour with in the cluster.

One of the strongest points of Panipat is its depth and its strong intra-cluster vertical links. Though designated as a handloom cluster, Panipat is hardly confined to weaving activity. In fact it is unique among textile cluster in India in the sense of being a real ‘fliere’, having a very large number of downstream and upstream activities in the textile industry ranging from manufacturing of textile machinery to making of textile made ups. Though made ups and carpets is the category of the final products in which the cluster specializes, it has a number of down stream activities like manufacturing of textile machinery, spinning, weaving, dyeing of yarn and processing. It is an important centre for manufacturing of handlooms and pit-looms, which are supplied in different parts of the country. In addition, it is a big market for textile machinery and textile inputs like yarn, dyes and chemicals. A large number of manufacturers of these items, including several MNCs have their stockiest in Panipat. The role of buyer supplier links in incremental innovation as well as in diffusion of technological knowledge is revealed clearly in our study. Both the backward and the forward links play important role in this respect. Presence of considerable loom making capability of the cluster enables the firms to make incremental improvements in the looms to suit the changing requirements of the market at a very low cost. This was reported by four of the sample firms. Similarly, presence of some machine making capability has made it possible for the cluster firms to get specialized machinery made at a low cost. For example, when chenille became the trendy fabric several cluster firms got chenille making machinery fabricated by local fabricating units. Similarly, when bath mats became the fastest growing item in the cluster, some firms got specially equipment designed for the dyeing of bath mats. They were fabricated by the local machine manufacturers. Since most of this equipment is made with the help of jugaru (locally articulated by technicians or artisans) technology, it is cost effective. One of the sample firms, supplying
fine quality woolen blankets to UNHCR (United Nations High Commission for Refugees) reported installing a specially designed spinning plant at the cost of Rs. 3 crores from local manufacturers. As against the normal ring frame which is suitable for a 2kg. cone, his ring frame is suitable for 15kg. cone. Designing for the frame was done by the entrepreneur, who is a Ph.D. in science.

_Jugaru_ technology/machines, created as a result of close buyer user links, may be much inferior to the state of art machines, but they play an important role in the survival of the cluster. _Jugaru_ technology has the double purpose of making small units viable by keeping the start up cost low and allowing the firms flexibility to cope up with the fast changing market demand. Possibility of getting new machines which could be made quickly and at a low cost makes product innovations swift and cost effective. It also reduces the impact of path dependency, by making replacement cost low. Visit to one of the fastest growing firms in the cluster demonstrated the importance of this capability very clearly. The firm was in the process of introducing several incremental product and raw material innovations, for which it was using locally designed machinery. The open spaces of the premises of the firm were full of discarded machines, which had become redundant in face of fast changing fashion trends. The firm was able to keep up with the fast changing trends by swiftly replacing the old equipment with low cost new machines. Even though the capabilities of cluster firms making equipment are quite elementary and unsophisticated; their flexibility and cost effectiveness can reduce, to some extent the constraint of path dependency, and make the technological change swift.

Interaction through vertical links also came out as important source of diffusion of raw material based technological change in our study. Presence of a large number stockiest of dyes and chemicals provides the knowledge about access to new raw materials and also the technical know how to use them. In the interviews with the suppliers of dyes and chemicals, it was reported that in addition to facilitating use of new chemicals and dyes etc. through their manuals, some dyestuff companies also organize workshops for this purpose. If needed, workshops/training programmes are conducted at the premises of some firm. One of the small firm entrepreneurs told us that though the recipes given in the manuals are sometimes unpractical and cost ineffective for small firms, the stockiest also tell them about the suitable modifications to make them viable for small units. This enables them to use standardized, good quality raw materials, albeit in a suitably non standardized method. Another entrepreneur told us about how he was able to solve the problem of spotting, which was coming in the process of
fabric dyeing, with the help of a simple tip given by his dye supplier. Thus the vertical links in the value chain are important not only in the transfer of tacit knowledge but also make it possible for the cluster firms to make use of sector specific codified knowledge for problem shooting.

Another important aspect of the depth of the cluster is the large number of specialized service providers which have emerged at various points of the value chain. It is tempting to label these service providers just as part of production capabilities rather than technological capabilities. As the part of value chain covering some specific stage of production, they certainly are a part of the cluster's production capabilities. But to the extent that they are instrumental in enabling the cluster firms to introduce product innovations, which they could not have been able to do on their own, they should also be considered as a part of technological capabilities of the cluster. For example, the cluster has some 80 design centers. At least five of them have CAD/CAM facilities. This provides an opportunity for the small firms in the cluster to introduce product innovations at an affordable cost. In our study many small firms reported making use of these centers. Similarly presence of a modern dyeing facilities and process houses in the cluster has resulted in several small firms to move on to export markets by upgrading their products and introduce new products with the help of specialized service providers. Previously small firms, who could not adopt modern technologies due to scale constrain, used to dye yarn/fabrics with primitive and highly polluting dyeing technologies such as tanki dyeing/dyeing with manual jigger. They were confined to production of low quality low end products. Now they have access to cost effective, high quality specialized facilities, which allows them to increase colour fastness of their products. More importantly, good dyeing and processing facilities has increased the incentive for using finer raw materials and going for high value products.

The presence of a large number of upstream and down stream activities in the cluster contributes very significantly towards flexibility and speed. Not only does it lend the cluster greater capability to face price competition, it also helps it in facing competition in terms of delivery schedule. The speed of Panipat firms can not be matched by the stand alone firms located elsewhere.380

380 According to Aggarwal, in case of breakdown of a machine in his Alps Industry, he has to wait for days and even weeks for repairing it, in Panipat it may be a matter of just a few hours. Similarly, a big order that a Panipat
From the overall perspective there is very considerable overlap of the production capabilities and the technological capabilities in Panipat. Its depth provides the cluster with a capability to respond swiftly to the changing requirements of the global market by bringing about suitable incremental innovations quickly and cost effectively. It is perhaps to this aspect of its capabilities to which cluster owes its impressive growth in last one and a half decades, in spite of the low intra firm technological capabilities of most of its firms, and also in spite of the deficiencies in its knowledge system.

In Panipat like in Moradabad, almost all the firms are family owned units and a large number of new firms emerge through the process of division of the parent unit. Therefore diffusion of technical knowledge through inter-generation transfer mechanism is an important source of accumulated technological capabilities. When the parent firm gets divided, each one of the owner entrepreneur of the newly formed units takes with him the accumulated knowledge that he acquired as a part of the parent company. Though in some cases this can result in knowledge lock in, on the whole it seems to be good for the dynamism of the young unit. Vidhu Paliwal, a young entrepreneur, who belonged to the family which owns biggest industrial family lineage group of firms in Panipat, reported having benefited greatly in terms of technical knowledge and knowledge about markets, by being a member of the family and having worked in the bigger family unit, as a . This small unit is one of the most innovative firms in its size category. The entrepreneur is very closely involved on product innovation and in finding new type of raw materials from all over the country. Due to his old links with foreign buyers, which he forged during his stint at the parent unit, he has lasting links with medium size buyers in some European countries. This allows him some design autonomy which is denied to other units.

Technological Change through Bilateral Horizontal Links

Like Moradabad there is little collective efficiency created in bilateral horizontal links in Panipat. There is very little transfer of technological knowledge through informal social networks. Nor is there any evidence of sharing of resources like specialized machines or skilled labour. Co-operation in technological matters is not common among the dynamic firms in Panipat. Due to fierce competition, the milieu in Panipat is defined by utmost secrecy and firm can meet in a few days due to availability of all the required skills in big quality, Alps industry may not be able to do in months.
mistrust. Not only is it rare for the entrepreneurs to share technological or market related information, there are regular attempts by them to poach each others' clients.381

Little co-operation in horizontal links that exists in the cluster is largely confined to small and technologically static firms catering to the domestic market. Almost all the 15 firms, which reporting co-operation with rival firms were co-operating with the members of their own community. A majority of them belong to the Hyderabadi community. All of them belong to the category of very small/small firms operating in the domestic market. They have very little new knowledge to share with each other belong to the category of very small/small firms operating in the domestic market

<table>
<thead>
<tr>
<th>Type of Co-operation</th>
<th>No. of Firms Co-operating with Rival Firms</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N=45</td>
</tr>
<tr>
<td></td>
<td>Regularly</td>
</tr>
<tr>
<td>Share New Technological Knowledge</td>
<td>10</td>
</tr>
<tr>
<td>Share Knowledge about New Markets</td>
<td>8</td>
</tr>
<tr>
<td>Share Equipment/Capacity/Labour 23,44,45</td>
<td>3</td>
</tr>
<tr>
<td>Any Other form of Co-operation</td>
<td>1</td>
</tr>
<tr>
<td>Firms Co-operating with rival firms in at least one of the above aspects</td>
<td>10</td>
</tr>
</tbody>
</table>

Note: Numbers in the parenthesis show percentages

**Multilateral Co-operation**

Panipat has little evidence of multi-lateral joint action, coming as a result of co-operation in multilateral horizontal links.382 Though there are several trade associations, their role in the promotion of innovation is negligible.

HTMA (Haryana Textile Manufacturers Association) was started in the year 1983. According to Mr. Gulshan Gera, an ex-president, the association was quite active till 1993,

381 According to Chavan, in the days of traditional snail mail it was not uncommon for the entrepreneurs to bribe the postman to get the address of the foreign client of the rival firm.

382 Though the cluster has several local trade associations, none of them is inclusive. Nor are they active in the process of technological upgradation. Some of the associations, representing sectarian interest of producers/traders operating at various levels of value chain are Yarn Traders Association, Panipat Dyers Association, Haryana textile manufacturers association, All India Shoddy Industries Association, Shoddy Blankets manufacturers association, and Industrial Area Association.
when it had as many as 500 members. But gradually, it became defunct. Most of the manufacturers, catering to the domestic market are represented by PPLMAs (Panipat Powerloom Manufacturers Associations) started in 1998. The association had become active after the imposition of excise duty on power-loom sector, in 2003, which was earlier exempt from excise duty. Though so far the association has not been involved in the process of technological upgradation, the secretary, Mr. Ashok Banga said that they are acutely aware of the technological gaps and now that the association has become active, he will try to be involving it in the task of technological upgradation.

Panipat Handloom Manufacturers Federation is the apex body of nearly 40 local area associations, representing handloom manufacturers. The main functions of the associations include lobbying with the local administration for power and other facilities, and resolution of disputes with buyers and transporters etc.

The exporters are represented by HHEA (Haryana Handloom Exporters Association). Not all exporters are its members. Among the sample firms, out of 33 exporters, only 11 reported being its member. On the whole, though there are a large number of local trade associations, their role, at best is confined to lobbying and conflict resolution. None of them have been active in the matters of technological upgradation.

According to Mr. Rao, of the Textile Committee, “Most the trade associations in Panipat, with a possible exception of the PDA (Panipat Dyers Association) and PYMA (Panipat Yarn Makers Association), are dead. The exporters’ association is rendered ineffective because of lack participation. Lobbying is the only function of the associations. But even in this they are not very successful.” Recently, Textile Committee has involved some of the local associations like HHEA and PDA, in the various technological upgradation and market development initiatives taken by its office, in its capacity of being the apex network organization involved in the CDP, which has just started in the year 2002.

383 At the time of the field work for this project, the federation was actively lobbying for the withdrawal of the 4% excise duty which had been imposed in 2003 budget. Since only units with less than 10 power-looms, or with annual turn over of less than Rs. 20 lakhs were exempt from excise duty, there was great despondency in this segment of the industry. The secretary of the federation claimed that half the units in Panipat will close if the excise duty exemption was not restored.

384 The exporters, though not networked with local bodies, however are closely networked with national level bodies like HEPC(Handloom Export Promotion Council), CEPC(Carpet Export Promotion Council), PDEXCIL(Power-loom Development and Export Council), TEXPROCIL and FIEO(Federation of Indian Exporters), from where they some technological knowledge and also get information about markets and various government schemes.
*Technological Change through Vertical Links*

Both the meso and micro level enquiry provides evidence for significant contribution of intra cluster vertical links in the management of technological in the cluster.

In the firm level study local suppliers of raw materials, followed by local suppliers of machinery emerge as the most important actors in helping the firms in managing technological change. Role of sub-contractors is also significant.

**TABLE 5.16 - Vertical Links Facilitating Technological Learning**

<table>
<thead>
<tr>
<th>Vertical Links</th>
<th>Inside Cluster</th>
<th>Other Cities in India</th>
<th>International</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Significant</td>
<td>Marginal</td>
<td>Total</td>
</tr>
<tr>
<td>Suppliers of Machinery</td>
<td>12</td>
<td>9</td>
<td>21</td>
</tr>
<tr>
<td>Suppliers of Raw Materials</td>
<td>13</td>
<td>11</td>
<td>24</td>
</tr>
<tr>
<td>Sub-contractors</td>
<td>10</td>
<td>7</td>
<td>17</td>
</tr>
<tr>
<td>R&amp;D Institutes</td>
<td>2</td>
<td>4</td>
<td>6</td>
</tr>
<tr>
<td>Association</td>
<td>2</td>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td>Private Consultants</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

Note: Numbers in the cells represent number of firms. Numbers in the parenthesis show cell number as a percentage of total number of sample firms.

**Role of External Links**

The evidence does not support the hypothesis of important role of international sources in promoting technological change. Only area in which a significant number of firms reported contribution of foreign buyers is developing new design.\(^{385}\) This is not surprising, given the fact

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\(^{385}\) One exporter said that the detailed construction and colour guideline for the designs given by some Japanese buyers so are good that they are treated as training manuals.
almost all the exporting firms are manufacturing against the designs provided by foreign buyers. What is significant in this respect is that as many as 22 firms reported depending on their own sources for developing new products/designs, as against 8 who said they are helped by their foreign buyers. Though 5 firms did report getting some knowledge about new technologies from outside sources, these sources, by and large, were international fairs and exhibitions, rather than their foreign buyers. Only three firms reported getting knowledge about new machines from the foreign suppliers of machinery. Domestic suppliers of machinery, though less important than local suppliers, turn out to be significant actors in the management of technological change by firms. Ten firms also reported benefiting from R&D institutions located in Delhi and other parts of the country.

Testing is another part of the technology management for which the cluster firms depend on firms in Delhi and other cities. As many as 14 firms reported getting testing done in Delhi, as against 19 who got it done within the cluster; 10 in their in-house labs and 9 from NITRA and other labs in the cluster.

<table>
<thead>
<tr>
<th>TABLE 5.17- Sources Facilitating Technological Change</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Activity</strong></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>New Technological/Machine Knowledge</td>
</tr>
<tr>
<td>Installation of New Equipment</td>
</tr>
<tr>
<td>Modification/Repair of Machines</td>
</tr>
<tr>
<td>Developing New Designs/Products</td>
</tr>
<tr>
<td>Testing</td>
</tr>
<tr>
<td>Acquiring Certification</td>
</tr>
</tbody>
</table>

Note: Numbers in the cells represent number of firms. Numbers in the parenthesis show percentages.

On the whole the contribution of intra vertical links emerges as an important factor facilitating technological change in the cluster. Secondly, by and large market links emerge as stronger as compared to links with non firm actors in the value chain. The role of international links such as foreign buyers and suppliers of inputs does not emerge as significant.
5.3 ORGANIZATIONAL INNOVATIONS

*Intra Cluster Organizational Changes*

Though there is no major organizational innovation taking place at the cluster level, the organizational setup of the cluster is undergoing continuous changes with respect to sub-contracting patterns and degree of vertical integration/disintegration of different processes. In a large number of cases organizational changes in Panipat are inextricably linked with technological changes. Unlike Moradabad, where the pressure to improve quality has resulted in vertical integration of the quality critical stages of manufacturing at the export houses, in Panipat, there is no simple, unidirectional trend. Both the tendencies; tendency towards greater integration, as well as tendency for sub-contracting more activities can be simultaneously found in the cluster. Most of the changes in the sub-contracting pattern are prompted by the need to improve quality with the help of new process technologies.

Some of the bigger units are integrating in the backward stages, like spinning, finishing of fiber/fabric, and weaving, in order to bring improvement in quality as well as decrease the cost.\(^{386}\) In a reverse trend, several firms, including some fairly big firms, are utilizing the services of specialized service providers in order to bring about desired product and quality changes.\(^{387}\) Since the service providers are able to use new technologies/equipment which is unviable for individual firms due to their scale intensive nature, it allows small firms to upgrade the quality in activities like designing, spinning, dyeing and finishing, by availing their services. Increased use of sub-contracting practices has made the diffusion of technologies/equipments like Open End spinning, Cone dyeing, automatic jiggers (for dyeing) and CAD-CAM (for designing) much faster and more cost effective than it would have been in the absence of changes in the sub-contracting practices.

*Intra-firm Organizational Changes*

In addition to organizational changes which concern the links of the firms with other actors in the value chain, there are several changes which are aimed at changing the internal organizational setup of the firms. As many as 30 (66.6%) of the sample firms reported

\(^{386}\) For example, some firms, which have now introduced in-house weaving, in order to use automatic looms for finer quality. Similarly, some of the units, who depended on market for finishing fabric/fiber, have started modern in-house process house process houses. Some of the firms, who used to buy yarn from the market, have started in house spinning now.

\(^{387}\) For example, one big firm, which used to do all weaving in house are now sub-contracting a part of weaving to specialized units using shuttle-less looms, in-order to be able to export high value products made with finer fabrics.
introducing one or more organizational change. Of the 13 firms catering to the domestic market, none has introduced an intra-firm organizational change.

Table 5.18 gives a summary picture of all types of the organizational changes which have been brought by the sample firms. It also states their reasons for introducing these changes.

There has been strong pressure on the cluster firms to improve the quality of their product as well as to improve the perception about the quality of their products. The cluster, which was, at one point of time, notorious for bad quality products, is forced in the post-reform period. Unsurprisingly, improvement in the quality and reduction in the rejection rate emerges as the most important motive for bringing organizational changes. Of the 45 sample firms, as many as 32(71.2%) units claimed improvement in the quality of their products. As in Moradabad, in Panipat also large number of firms reported improvements in the quality control methods in order to improve quality/reduction in rejection rate. As many as 18 of the sample firms reported enhancing quality control procedures and increasing the level of inspection. Four of the sample firms reported having opened up new quality control division, or ‘quality assurance division’, as one of the firms call it. One firm has installed close circuit TVs for better inspection. One firm has installed electronic quality checking machine. Some of them have started displaying quality charts.

Almost all the firms citing improvement of quality as the reason for organizational changes were catering wholly or partially to the global market. Not surprisingly the percentage of firms reporting improvement in quality among the firms catering exclusively to the domestic market (46.1) is much lower as compared to the percentage of all firms (71.2) experiencing improvement in quality.

As many 15 firms cited increase in productivity/reduction in cost as the motive. Firms have tried to do it mostly through better management of human resource. More extensive use of casual labour in place of permanent labour is one aspect of this strategy. 4 firms reported trying to increase productivity by employing technically qualified staff. Four firms reported offering more incentives to their employees in the form of productivity linked bonus. None of the

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388 So bad was the perception about the quality of the Panipat products that there is a commonly recited verse, which warns people to purchase textiles from Panipat at their own risk. It reads, Panipat jao naa, Jao to kuch khareedo naa, khareedo to dhovo naa, dhovo to phir rovo naa; Don’t go to Panipat. If you go there, don’t buy any thing, if you buy some thing, don’t wash it and if you wash it don’t cry (for bad quality).

389 One of them said it believed in JMTs, but can’t practice them in Panipat. The owner said that they want to provident fund (PF) benefits to all employees. But the migrant workers, who are highly mobile, are not interested. According to him another important reason for workers not opting for PF is that several firms in Panipat have
firms reported better inventory management as a strategy adopted for reducing cost. Only three of the sample firms reported improvement in production lay out. One firm has got the pit looms modified and is now installed them above ground, on the first floor. This has increased the productivity as well as augmented space. This firm has also installed some improvised cooling system in some parts of the production area. In-order to keep the items clean, this firm and some others have brought changes in storage methods. According to the entrepreneur this increase productivity and keeps the products clean.

Table 5.18 - Organizational Changes Introduced by Firms

<table>
<thead>
<tr>
<th>Type of Change</th>
<th>Increase in Productivity/ Cost Reduction</th>
<th>Reduction in Delivery Schedule</th>
<th>Improvement in Quality</th>
<th>Total No. of Firms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adding New Activities</td>
<td>2</td>
<td>0</td>
<td>7</td>
<td>7</td>
</tr>
<tr>
<td>Sourcing Out More Activities</td>
<td>0</td>
<td>0</td>
<td>12</td>
<td>12</td>
</tr>
<tr>
<td>Closer Interaction with Sub-contractors</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Improving Human Resource Management</td>
<td>14</td>
<td>0</td>
<td>0</td>
<td>16</td>
</tr>
<tr>
<td>Improving Inventory Management</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Better Quality Control</td>
<td>0</td>
<td>0</td>
<td>18</td>
<td>18</td>
</tr>
<tr>
<td>Any Other Change</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
</tbody>
</table>

Note: Numbers in the cells represent number of firms. Numbers in the parenthesis show percentages

None of the sample firms said that they introduced organizational changes for reducing delivery schedules.

Very few of the sample firms reported making special efforts for improving working conditions. However as more and more firms get inserted /aspire to get inserted in GVCs, the pressure to improve the perception about the quality of the products as well as the quality of working conditions has been going up. This has resulted in some firms resorting to measures duped the workers of their contribution towards PF. None of the firms reported practicing JIT with respect to capital or any change in inventory management. This is not surprising. Given the high density of stage manufacturers and specialized services, the cluster firms are anyway having very low inventory levels.
like installation of ETPs. Though 12 of the sample firms have installed ETP, it is operative in just a few of them.\textsuperscript{390} Only one of the sample firm reported purchasing equipment for controlling noise pollution and one firm reported purchasing air pollution scrubbers.

The number of firms acquiring certifications has been going up. Among the sample firms three are ISO 9000 compliant and two are ISO 9001 compliant.\textsuperscript{391} One firm has already acquired ISO 9002 and is in the process of acquiring ISO 14000. All the firms having acquired ISO certification (or in process), are in the size categories, ranging from medium to big.\textsuperscript{392} On the other hand not all the big firms are rushing for acquiring quality certification. Among the six big firms in the sample only three have acquired (or are in the process) some certification. According to some of them, ISO certification is unnecessary and it adds to cost.

Though all the firms which have acquired quality certifications are catering either fully or partially to the export market, none of them reported doing so on the insistence of the buyer. However, almost all of them agreed that they are going for certification as it enhances their chances of getting orders from big international concerns.

\textbf{5.4 MARKET INNOVATIONS}

Value addition through market innovation is one of the most important strategies opted by the cluster firms to increase their competitiveness. A large number of cluster firms are getting inserted in the global value chains through the buying agents.\textsuperscript{393} Consequently, there is significant change taking place with respect to the way marketing is organized. Since an increasing number of cluster firms are getting inserted in the global value chains through the buying agents there is significant change taking place with respect to the way marketing is organized. Tough many small exporters export directly, big firms are now operating through the buying agents in a big way.

A large number of new firms have entered the global market in the post reform period. As many as 8 of the sample firms, which were not exporting earlier, reported entering overseas.

\begin{itemize}
\item \textsuperscript{390} 15 said they don't require it, since they are not carrying out in-house dyeing or processing.
\item \textsuperscript{391} One firm is in the process of acquiring ISO 9001 and four firms are in the process of acquiring ISO 9002. Some exporters are going for buyer specific certifications, such as Wal-Mart certification. Two firms, operating through unconventional market channels claimed that they are observing all the ISO norms without actually acquiring certification. One of them is supplying to UNHCR and other is supplying for public sector departments like police and air lines etc.
\item \textsuperscript{392} Only one small firm has applied for ISO 9002.
\item \textsuperscript{393} The important retail chains, for which the cluster firms are working as commercial sub-contractors are led by global giants like Ikea, Wal-Mart, J.C. Penny, GAP, Pottery Barn, Target, Ikea, Nest, Mark and Spencer, Mohawk Crate, Barrel, Nest etc.
\end{itemize}

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market in the last five Years. Though almost all of the new entrants to the export market are small firms, they also include the biggest firm in our sample, and one of the biggest and most dynamic firms of the cluster; Golden International. As many as 20 of the sample firms reported entering new overseas markets in last five years. (Table 5.19) Among the new countries in which the cluster firms have entered recently are Spain, Portugal, Taiwan and New Zealand. Opening of *new show rooms*, visits to *fairs and exhibitions*, *starting their websites* and *net searching* for new markets are some of the innovations introduced by the cluster firms to increase their competitiveness.

Almost all the market innovations are confined to the firms who are operating, either exclusively or partially, in the export market (D and D&E category firms). The only market related upgradation effort, which is confined only to three domestic (D) firms, is in the form of attending fairs and exhibitions held at Delhi. Ten of the 13 firms belonging to domestic category have not introduced any market related changes.

Six of the sample firms reported opening up of new show rooms in last five years. Of these six firms two reported opening show rooms in Panipat, one in Noida, one in City centre Gurgaon and two in Delhi. One of the firms; the biggest export firm among the sample firms said they were opening three show room in the USA.394

<table>
<thead>
<tr>
<th>Type of Innovation</th>
<th>Number of Firms</th>
</tr>
</thead>
<tbody>
<tr>
<td>New markets: Total</td>
<td>20</td>
</tr>
<tr>
<td>Attending Fairs: Domestic</td>
<td>12</td>
</tr>
<tr>
<td>Attending Fairs: International</td>
<td>24</td>
</tr>
<tr>
<td>Opening Show rooms: Local</td>
<td>2</td>
</tr>
<tr>
<td>Opening Show rooms: Domestic</td>
<td>3</td>
</tr>
<tr>
<td>Opening Show rooms: International</td>
<td>1</td>
</tr>
<tr>
<td>Starting Website</td>
<td>10</td>
</tr>
<tr>
<td>Net Searching</td>
<td>8</td>
</tr>
<tr>
<td>Advertising in Print Media: Domestic/ local</td>
<td>4</td>
</tr>
<tr>
<td>Advertising in Print Media: International</td>
<td>1</td>
</tr>
</tbody>
</table>

394 This firm, with its head quarter at Jaipur, also reported exporting a part of its goods under its own brand name since 1986.
A large number of firms reported (increased) visits to *fairs and exhibitions* to brace themselves up to face the new competition. In all 31 of the 45 sample firms reported attending at least one fair. In all 5 firms reported attending only domestic fair at Delhi, while 17 reported attending only international fairs. Seven of the sample firms reported attending domestic as well as international fairs. Some of the most frequented fairs by the sample firms were life style fairs in Germany, Japan, USA, UK and Dubai. The most frequently attended fairs by the exporters was Heimtext fair at Germany (attended by 17 firms), followed by Germany’s Domotex fair (attended by 7 firms). Not all the firms attending international fairs had their stalls in these fairs. Only one firm reported attending ITMA, the textile machinery fair.

Another market related innovation that has diffused in recent years is the starting of websites by the cluster firms. Ten of the sample firms reported *starting websites* in last five years. Several entrepreneurs reported *net searching* for new markets.

Trying to build brands is not a common activity among Panipat firms. Almost none of the Panipat products sold under local brand name. Even though the representatives of foreign buyers recognize ‘Panipat type of goods’, the distinction does not reach foreign consumers. Even in the domestic market consumers identify Panipat products for their low price, rather than any special characteristic.

Developing an international brand is an expensive proposition. It may require as much as $5-10 millions to develop a brand in overseas market; an amount which the units in Panipat can not afford. While most to the big exporters are commercial sub-contractors of big global retailers, and their products are sold under the brand name of the lead firm, two of the big exporters reported selling some products under their own brand name in the international market. One of them, with its head quarters at Jaipur, is exporting items of home textiles mainly

395 Among the 14 firms not attending fairs/exhibitions 11 belong to the domestic category, while three were catering either partially or exclusively to the global market. Among the 13 firms belonging to exclusive domestic category, only two reported attending Delhi fair, and none reported attending any international fair. All but one of the 14 firms not attending any fair, were either very small or small.
396 Several firms said they go to fairs in Germany through German Chamber of Commerce because, unlike CEPT, it is able to get us strategic sites in the fair.
397 This firm, Mittal International, is a medium sized firm which has invested a considerable amount in the purchase of equipment for opening a modern process house. It has also introduced several incremental innovations in process technologies.
398 It is not surprising that the Panipat firms do not have a brand name in the global market. Few Indian firms even in the large industry sector have been able to sell in the international market of home textiles, under their own brand name; Bombay Dyeing, Vimal and Sham Ahuja being some exceptions. Local firms even in countries like China, Philippines, Indonesia and Pakistan, which produce much better quality products, are not able to sell their products under their own brands. Most of the brands in Home textiles belong to USA, Japan and European countries.
in Europe and USA. The other firm reported exporting blankets to Australia under its own brand name. In all three of the sample firms reported their own brand name.

Like in Moradabad, there is no significant cluster based market innovation introduced at the cluster level, either through public or private joint action in Panipat. Though WSC has organized some exhibitions in the past, participation by cluster firms was negligible. Earlier several small handloom units were members of the handloom co-operative societies. They used to participate in the handloom exhibitions all over India, where they got the opportunity to showcase and sell their products in several cities. Ministry of Textiles, which organized these exhibitions, also arranged for the visit of the members of these societies. With the decline of the co-operative movement in the cluster this opportunity is no more available to the small firms operating in the domestic market. In the year 2002 the office of Textile Committee, in its capacity of link agency of the CDP initiated jointly by the Ministry of Textiles and UNIDO, has organized some BSMs (buyer-seller meets). But it is too early for the initiative to yield results.

5.5 INNOVATION, TECHNOLOGICAL CHANGE & DEVELOPMENT

5.5.1 Technological Change, Innovation and Economic Growth

Though the post reform period can be termed as the period of high growth for the textile cluster of Panipat, not the entire period has witnessed uniformly high rate of growth. Nor have all the firms been on fast track growth path. The firms have been able to survive on growing volumes. According to several observers, the rate of growth of exports, which was very high in years 1992-95 has receded from 1996 onwards, because of reintroduction of income tax on export incomes and reduction in the duty draw back rate. For the cluster as a whole, after the phase of accelerated growth in early 1990s, now there is phase of steady state growth. While, due to their lower over-head cost, some small units continue to do very well in early 2000, some of the big and established firms like Rugs India and Paliwals exports are shrinking in size.

Secondly, though the value of the output and exports in rupee terms has grown at fast rate in the textile cluster of Panipat, most of the growth has come from volumes rather than from

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399 This was mentioned by the MD, WSC in his interview.
400 According to Vidhu Paliwal, one of the young entrepreneurs, Panipat has some very big units, owned by third generation entrepreneurs, like Mahajans, Paliwals, Jains and Aggarwals. Most of the first generation entrepreneurs of these units peaked in 1970s and saw a down turn in 1980s. Their second generation diversified in fine fabrics. Some of the units saw revival since early 1990s and are now on growth path.
value addition. The cluster continues to cater to the lower end of the global made-ups market, where the average market price of the item lies between $4-5 per piece to $9-10 per piece. Any thing beyond $10, buyer looks at the European manufacturers, especially Italian. The cluster has not been able to compete successfully with countries like China. According to almost all the entrepreneurs, fierce price competition caused a fall in the unit value realization of product in both the markets; domestic and export market. It was reported that the dollar value of a typical item exported from Panipat has gone down by as much as 30% in dollar terms since 1995. According to one of the exporters, profit rates which were as high as 50% only a few years back, have come down to 7-8%. The firm level survey suggests that while 66.6% of all firms have reported increasing trend in turnover in last 5 years, as many as 70% of them have reported decreasing rate of profits, while 42% have reported falling trend in absolute levels of profits.

Thirdly, even though all segments of the industry have experienced growth in their total turnover in 1990s, there is marked difference between the economic indicators of firms catering exclusively to the domestic market and other firms. The difference in their profit rates is particularly striking. The firm level survey shows that the performance of the segment of industry catering exclusively to the domestic market has been worse than the other two categories, both in terms of trends in total profits as well as profit rates. (See Table 5.20) While 48% firms operating exclusively in the global market and 57% firms operating in both the markets have reported increasing trend in the absolute amount of profits, not a single firm operating exclusively in the domestic market have reported increase in rate of profits or level of profits. Due to lack of technological dynamism as well as due to increased competition from other textile centers like Jaipur, and Surat, this segment has seen sharp decline in the prices of items supplied by them. This has led to sharp fall in the profit rates since 2000, which on an average, vary between 2-5% in this segment. Many firms in this segment are in crisis and are sticking to the industry only due to absence of an alternative.

On the whole, though the turnover and the volume of exports have been growing at an impressive rate in the post reform period, falling rate of profits puts a question mark about the

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401 For example, the bed cover which used to fetch at Rs300 earlier is today sold at Rs.125. On an average, there is a drop of 40% in the power-loom items. According to one entrepreneur operating in the domestic market, their volumes have also gone down. Whereas earlier Panipat's local market used to attract as many as 500 buyers from all over the country, their average number has come down to 100.
possibility of continuation of this trend.\footnote{As many as 69\% of the sample survey firms reported falling rate of profits, and as many a 42\% reported declining trends in the absolute level of profits.} Though in the short run, market related dynamism and growth of exporters has been made possible by some technological and organizational innovations as well as by the flexible nature of the production system, it is suggest by the evidence emerging from this thesis that the long run dynamism cannot be taken for granted unless steps are taken to bring about significant technological and functional upgradation through enhancement of technological capabilities of the cluster.

<table>
<thead>
<tr>
<th>Market orientation</th>
<th>Trends in Turnover</th>
<th>Trends in Total Profits</th>
<th>Trends in Profit Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exporters N=25</td>
<td>+ 17 (68.0)</td>
<td>+ 12 (48.0)</td>
<td>+ 7 (28.0)</td>
</tr>
<tr>
<td></td>
<td>= 6 (24.0)</td>
<td>= 5 (20.0)</td>
<td>= 5 (20.0)</td>
</tr>
<tr>
<td></td>
<td>- 2 (8.0)</td>
<td>- 8 (32.0)</td>
<td>- 13 (52.0)</td>
</tr>
<tr>
<td>Domestic N=13</td>
<td>+ 9 (69.2)</td>
<td>+ 4 (30.8)</td>
<td>+ 9 (69.2)</td>
</tr>
<tr>
<td></td>
<td>= 2 (15.4)</td>
<td>= 0 (0.0)</td>
<td>= 0 (0.0)</td>
</tr>
<tr>
<td></td>
<td>- 2 (15.4)</td>
<td>- 4 (0.0)</td>
<td>- 7 (7.7)</td>
</tr>
<tr>
<td>Exporters + Domestic N=7</td>
<td>+ 4 (57.1)</td>
<td>+ 1 (14%)</td>
<td>+ 1 (14%)</td>
</tr>
<tr>
<td>All Firms N=45</td>
<td>+ 30 (66.6)</td>
<td>+ 16 (35.5)</td>
<td>+ 8 (17.8)</td>
</tr>
<tr>
<td></td>
<td>= 11 (24.4)</td>
<td>= 10 (22.2)</td>
<td>= 6 (13.3)</td>
</tr>
<tr>
<td></td>
<td>- 4 (8.8)</td>
<td>- 19 (42.2)</td>
<td>- 31 (68.9)</td>
</tr>
</tbody>
</table>

Note: Numbers in the cells indicate the number of firms. Numbers in parenthesis indicate percentage of row totals. (+) show increasing trend, (=), constant and (-) shows decreasing trend.

5.5.2 Technological and Organizational Changes: Impact on Volume of Employment and Wages

Indian experience in the post reform period has suggested that high growth rate of output does not automatically ensure proportionate increase in employment opportunities or better quality employment. However the evidence from this research suggests that fast rate of growth of output in Panipat has generated significant employment opportunities in the cluster, though the quality of work has not improved much.

Though there is no official statistics available for the latest trends in number of persons employed in the textile industry in Panipat, data from various sources like NITRA and Textile Committee etc, suggest an upward trend. Secondly on the basis of the demographic evidence it can be inferred that employment opportunities in the cluster must have increased considerably in
the last decade. It is a generally accepted view among the cluster actors that the number of persons employed in the industry has been steadily increasing over time. According to most of the entrepreneurs, there is no dearth of work in Panipat. Higher labour productivity resulting from change in technology, along with augmented supply of weavers because of thickening stream of migrant weavers from UP and Bihar, has taken care of the problem of scarcity of labour, which the cluster had in the past, even as it has prevented any upward trend in the real wage rate and labour cost from. At the same time there is little evidence of unemployment in the cluster, as the employment opportunities in the cluster have been going up.

The inference about growing employment opportunities is also supported by the evidence from the firm level survey, presented in Table 5.21. As many as 10 of the sample firms reported increase in the number of temporary workers in last 5 years, and one reported increase in number of permanent workers. As against this, only one firm reported decrease in number of permanent workers, while none reported decrease in the number of temporary workers. Moreover, the growing number of firms in the cluster, (suggested by the data provided by DIC) must have created new employment opportunities.

The increase in employment has come in face of change in technology in some activities. In weaving for example, an increasing number of shuttle-less looms, which have labour productivity at least six times as high as on power-looms, must have decreased unit requirement of labour. But this has apparently not resulted in decrease in employment opportunities. This has happened due to two diverse reasons; increase in total volume of output, made possible by growing export opportunities, and revival of handlooms and pit-looms, which are more labour

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403 An indirect support for the increased employment opportunities in the cluster is provided by the fact that decadal rate of growth of population in Panipat during 1991-2001 was higher as compared to the previous decadal rate. Secondly, while decadal rate of growth of the district was lower than the rate of growth of the state of Haryana during 1981-1991, in 1991-2001 it was higher than that of the state. (See Census of India 2001) This suggests the possibility of considerably higher in migration in the district during 1991-2001 as compared to the previous decade. Since apart from agriculture, textiles is the main economic activity in Panipat, it is reasonable to assume that the industry was creating enough jobs to absorb larger number of migrants.

404 According to one of the entrepreneurs earlier there used to be scarcity of skilled handloom weavers. Poaching of skilled labour was not uncommon in 1980s. But now, with the proliferation of power-looms and shuttle-less looms on the one hand and steady flow of migrant workers on the other hand, the problem of scarcity has been taken care of.

405 This is not to suggest zero rate of involuntary unemployment in the cluster. Moreover Panipat is unlikely to have the type of direct evidence of unemployment that one encounters in Moradabad even if employment opportunities were going down. The reason for this is that since a large fraction of Panipat workers are migrants, they go back to their native states in case of lose of jobs.
intensive than power-looms, which were the most dominant technology used in the pre reform period.\textsuperscript{406}

Other activities, like spinning and dyeing have also seen movement towards labour saving technologies. But the total employment even in these activities has gone up due to positive effect of the growing number of specialized units in these activities as well due to expansion in ancillary and auxiliary units. On the whole, even as the over-all unit requirement of labour per unit of output may have come down as a result of changes in process technologies,\textsuperscript{407} this seems to be compensated by the increase in total volume of activity in the textile industry in Panipat. To the extent that the technological change brought about by the cluster firms have allows them to increase their output and exports by making them more competitive in the global market, the negative impact of technological change caused by a fall in unit requirement is neutralize. Secondly, change in technology itself may generate indirect demand for some type of labour, e.g. use if IT must have created demand for IT professional who may be required to train existing pool of workers.

Though the demand for labour has been going up, the cluster has seen little increase in real wage rate of the permanent workers, who, in majority of the cases continue to earn no more than the minimum wages. However, according to several entrepreneurs, incomes of piece rate workers have gone up considerably in last few years. As can be seen in Table 5.21 many as 15 sample firms reported increase in the daily earnings of piece rate workers, which have come about due to both reasons; increase in the piece rate as well as due to availability of more work per person. It was generally believed that a power-loom weaver can now make as much as Rs. 200 on a good day. However, daily earnings of handloom weaver seldom exceed Rs. 150. Average Monthly earnings of piece rate workers rang between 1200 to3000. In the peak months earning of males working on piece rate basis may shoot up to Rs.5000. but in the lean period, due to non availability of work the monthly earnings are much lower.\textsuperscript{408}

\textsuperscript{406} Evidence for this comes in the form of data suggesting growing number of not only of the shuttle-less looms but all type of looms, including handlooms and pit-loom in the cluster (See Chauhan 2001).

\textsuperscript{407} The argument apparently applies for labor saving technologies and not in the case where the technological change is labour using rather than being either labour saving or neutral.

\textsuperscript{408} Weaving work for export market is seasonal and lasts for six months. According to one supplier, the average income of a handloom weaver is no more than Rs. 60 per day.
TABLE 5.21- Trend in Number of Workers

<table>
<thead>
<tr>
<th>Firm Size: Number of Workers</th>
<th>No of Firms</th>
<th>Trend in Number of Permanent Workers</th>
<th>Trends in Number of Casual Workers</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>+ = -</td>
<td>+ = -</td>
</tr>
<tr>
<td>1-99</td>
<td>29</td>
<td>4 24 1</td>
<td>3 26 0</td>
</tr>
<tr>
<td>100-499</td>
<td>11</td>
<td>3 8 0</td>
<td>5 6 0</td>
</tr>
<tr>
<td>&gt;500</td>
<td>5</td>
<td>1 4 0</td>
<td>2 3 0</td>
</tr>
<tr>
<td>All firms</td>
<td>45</td>
<td>8 36 1</td>
<td>10 35 0</td>
</tr>
</tbody>
</table>

Note: Numbers in the cells indicate the number of firms. Numbers in parenthesis indicate percentage of firms. (+) show increasing trend, (=), constant and (-) shows decreasing trend.

5.5.3 Technological and Organizational Changes: Impact on the Quality of Employment

Casualization of Employment

Like Moradabad, most of the labour engaged in blue collar jobs employed in Panipat is casual labour. In spite of considerable dynamism in the cluster, and increased employment opportunities, Panipat can be described as a cluster traveling on the low road of flexible specialization. It thrives mainly on low labour cost and evasion/avoidance of various legal provisions. Units under same ownership are registered in different names in order to avoid the provisions of the Factory Act, which is applicable to units employing more than 20 workers. Even in the registered factories only 10-20% of labour is shown on the muster. Of these only 1-2% workers are given gratuity and other benefits. This gives the non factory sector a huge cost advantage vis-à-vis factory segment.

According to one of the entrepreneurs, even the units which are prepared to give PF (provident fund) may not succeed, because the workers have no faith in the system. According to one worker, in textile industry there is no guarantee of system of PF working. Since some units have bungled with the workers’ share of PF, workers don’t want to risk their hard earned income. Moreover, since a large percentage of workers are migrants, they are not sure of their coming back to the cluster.

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409 Among the sample firms the overall ratio of permanent to casual workers was 30%and 70%respectively. See table5.21 for detail. The overall ratio of permanent workers in the industry is likely to be much adverse as compared to the ratio, prevailing in the first tier firms.

410 Since workers with at least five years continuous service are entitled for these benefits, most of them are laid off before they complete five years and replaced with new
According to the labour statistics of the district out of a total of 31626 factory workers employed in Panipat, as on 31.12.2001, only 2870 worked in textile industry. Textile industry, in which only 76 units were registered as factories, is almost completely free of any type of labour problems. The reason for this is that labour working in textile industry in Panipat is not organized. Though the district has 80 registered trade unions, including INTUC and CITU, the number of textile workers who are affiliated with any trade union is negligible. In fact the impact of TU among textile workers has gone down over decades. Earlier, TUs were strong. But since 1980s most of the labour employed even by the big units is contract labour, which is not the part of the organized labour unions. A major part of labour management in Panipat is in the hands of the contractors, called masters. They often get labour from their own home town and have close links with them. They may give them shelter in the initial stages, and support them for a short while when they are out of work. Masters fix the wage rate and mode of payment. Normally contractors, who are paid on piece rate basis, pay their workers on the basis of daily wages.

Even in the big units enforcement of labour laws is weak. According to Mr. Khatri AD, Industrial Safety, Health and Welfare, since there is acute shortage of staff in the office of labour commission in Haryana, enforcement of the Act is lax. There are no more than 25-30 inspections per month. Persecution is done only in the case of serious violations. Since in most of the textile units number of workers on the muster is small, there is no provision for the safety officer or welfare officer on the factory premises. Since the textile workers are not organized, there are virtually no complaints from the trade unions. According to Mr. Pattan, ACL(Assistant Commissioner labour), “With globalization things are changing. The mandate given to us is, ‘don’t penalize. Only advise.’ Sympathies of the ACL seem to be lying with the employers. According to him ‘it is our responsibility to see the welfare of both the sides; the workers and the employers. Some workers are very cunning. If there are big orders to be met, they insist on advance of Rs.10,000-15000 and then go and take up employment with another concern. Since most of the workers are migrants, they refuse to be a part of PF scheme. Any way, since most of the textile workers are casual, very few are entitled to PF.”

411 Of the 9,297 workers in the district, who are members of any trade union, almost all belong to three large public sector units present in the city.
412 According to one small entrepreneur, the contractor on his unit is paid on the piece rate basis. He keeps one salary plus 5% of the entire wage bill and distributes the rest among workers. This keeps the incentive for higher productivity.
413 Safety officer is mandatory for units with more than 1000 workers on roll, and welfare officer is provided for units with more than 500 workers.
Majority of workers in Panipat; both blue collar and white collar, are migrant workers. Almost all the weavers come from stats like UP and Bihar, are not an integral part of the social milieu of the cluster and have little identity as a social group. According to one of the suppliers of the hand woven items like carpets and durries, there are virtually no local weavers. People in Panipat and Haryana are too independent minded to work under some one. They like to be their own masters. Migrant weavers, on the other hand, are a big asset. They are skilled and at the same time pliant. Since they are already trained, they are easily able to weave the design set by the master weaver. They get tuned to our processes very quickly. Many units provide residential facilities to the weavers coming from places like UP, Bihar and WB. This ensures that they are available for 24 hours and can be put to looms for longer hours. Even if the master is paid on piece rate, longer working hours mean considerable cost saving due to higher utilization of the space and looms. Secondly, in case of short delivery schedules, availability of weavers for 24 hours is a big advantage. Virtual infinite supply of migrant skilled workers, vis-a-vis their demand means that their wages are no higher than the unskilled workers. But some of the big units are now treating their skilled workers like an asset. They are providing facilities like residence, primary health care and even schooling for children in order to bring a fall in the rate of turn-over of workers.

Though wage rates of blue collar workers have not seen much increase, some big firms are hiring qualified staff, like designers etc., at salaries which are comparable to or even better than those provided by reputed brands.

Employment of Women

Unlike other textile clusters in the world, whose growth is fueled by globalization, in Panipat in spite of rapid export led growth there has been no feminization of labour. Textile industry in Panipat has negligible presence of female workers. There are very-very few women employed in the factory set up. A handful of women can be seen in select units, where they are engaged in low skill activities like reeling. On an average daily wage earned by female workers is Rs.60-70, as against Rs.100-150 earned by male workers. In the units where residential accommodation is provided, few migrant women, who have come with their husbands, can also

414 According to one exporter, even though items woven in Panipat don't require great artistic skills, a skilled weaver is a big asset, as he can have four times higher productivity as compared to a raw hand.
415 In countries like Korea, Indonesia and Malaysia use of cheap and vulnerable female labour has been one of the important reasons for competitiveness of the industry.
416 Among the sample firms total number of female workers was 368, per unit 8.1.
be seen to be engaged in weaving. Though, stitching, traditionally considered to be female activity, has become a prominent due to the fast growth of made-ups, there is hardly any trend of feminization of labour in that activity. Though some small units, using traditional stitching machines have engaged women for margin stitching and other simple jobs, presence of women in stitching departments of units with modern Zuki machines and other facilities is negligible. In fact seen from a long term perspective, with the sharp decline in the HH segment of the industry, women's participation in economic activity has gone down. Today some 'loose work', like knotting, beading and margin folding, done by women working in the HH units.

According to the ACL there is virtually no child labour in the textile industry, except for a few children who may be helping their mothers in activities like knotting taking place in the HH units. This was supported by the evidence collected by visits to factories. None of them had children working on their premises.

Polluting and Hazardous Work

Certain activities carried out in textile industry in Panipat, such as dyeing and processing, are highly polluting/hazardous. Pollution levels are particularly high in the unorganized segment of the industry, which uses obsolete and jugaru technologies. Obsolete and jugaru technologies are adopted even by the units registered under the Factories Act in the cluster. The levels of work place pollution are high even in big export units.

Greater export orientation of the cluster and its greater insertion in GVCs has not brought any improvement in the working conditions in the cluster. Though big retail chains do have their list of specifications vis-à-vis work place norms, they are not particular about compliance of norms of work place safety and pollution levels etc., as long as the quality standards of the product are acceptable and the delivery takes place in time. Nor have legal requirements for clean technologies made significant dent in the problem of pollution in the cluster. As it is mandatory for all the units with dyeing and other polluting activities a considerable number of big and medium size units in the cluster have installed ETPs. Some of them have done so in order to meet the requirements of foreign buyers. But only a handful of units run them regularly. The process of globalization is accompanied by leniency in anti

417 Though the representatives of the big buyers do make regular inspections, in most of the cases they are an eye-wash. In many cases, the inspectors are bribed to give favourable reports.
pollution laws and in their enforcement.\textsuperscript{418} For example, dyes and dye intermediaries have been included in the list of 19 highly polluting activities issued by Govt. of Haryana. But, according to the owner of Raj Exports,\textsuperscript{419} enforcement of anti pollution laws is very much relaxed in Panipat. Hardly any unit in Panipat has a properly operative ETP\textsuperscript{\textdagger}. On an average, a unit is able to save as much as Rs. 2000 per day by not conforming to anti pollution laws. According to Mr. Chugh of Sheena Exports, a big and fast growing export house in Panipat, though they have installed ETP to meet the requirement of HPCB (Haryana Pollution Control Board), it is not operative. Running cost of ETP is too high to be economically viable.\textsuperscript{420} Therefore, according to him, CETP (Common Effluent Treatment Plant) is the only viable solution for the pollution problem of the cluster. Though the environment department of the state, with the help of the Industry department, has got Rs.6.3 crores earmarked for creating CEPT\textsuperscript{421}, the work on the proposed facility of CEPT has not started. But the process of shifting of dyeing units to the approved area in sector 29, has started. In the meanwhile HPCB has placed ban on the dyeing activity in some units, which were using highly polluting and outdated equipment. This has however not made significant dent in the problem of pollution in the cluster. But what has helped over the time, in reducing the levels of work place pollution in the cluster, is establishment of a large number of specialized dyeing and processing units, which use upgraded technologies. As a result, many of the smaller units, which earlier used to depend on obsolete and highly polluting equipment for in house dyeing, are now availing of these facilities. Another environmental friendly change that has taken place among the export units in the cluster is the use of eco friendly azo free dyes. This has been purely due to the pressure from the foreign buyers.

But in-spite of some improvements levels of pollution in the cluster continues to be high. Even in the best of units processing and dyeing units have obnoxious smells and fumes. There is little attempt by the firms to controlling noise pollution and air pollution. There are no safeguards used in activities like carding and weaving, which can cause extensive damage

\textsuperscript{418} One way of diluting anti pollution laws brought about by the environment department is considerable simplification of procedures for clearance from the department. For detail see Udyog Bandhu, Apr. 2003, Dept. of Industries, Haryana

\textsuperscript{419} Home textiles unit located in Ghaziabad, UP

\textsuperscript{420} According to Mr. Chugh, the running cost of ETP works out to be Rs.5000 per day.

\textsuperscript{421} Source Udyog Bandhu, Apr. 2003, Dept. of Industries, Haryana.
5.6 CONCLUDING REMARKS

There is some commonality between the findings of the Panipat cluster and the Moradabad cluster, however, there are some significant differences which are reflected in the conclusions paraphrased in following summary remarks.

- Panipat also indicates the evidence of limited technological change, but the cluster level explorations reveal that the extent of technological change taking place in Panipat is significantly higher compared to Moradabad. While raw material change is the main form of technological change, followed by product changes in Moradabad, Panipat provides significant evidence of change in process technologies.

- While, in Moradabad the process technologies used in the cluster have seen little upgradation, Panipat, has seen considerable change in process technologies, along with some changes in products and raw materials. Several major manufacturing activities have undergone considerable change in process technologies in the post 1991 period. There is evidence of introduction and fast diffusion of new technologies at all production stages viz. CAD-CAM for designing, open end technique for spinning, shuttle-less loom for weaving, cone dyeing for yarn and introduction of soft flow dyeing. Several of these changes introduced by firms in Panipat fall under the category of significant changes.

- Though Panipat firms are also catering to the lower end of the global market, there is some evidence of value addition through technological upgradation in Panipat. The cluster which was earlier confined to items like furnishing fabrics and bed covers has entered the more value added, cut and stitch segment of made-ups. The short run survival and growth of the cluster is facilitated by the fact that at present ‘Home Textiles’ is the fastest growing segment of the global textile market.

- While in Moradabad, organizational changes like vertical integration and enhanced supervision, are adopted as the primary, or even the only measure for enhancing competitiveness by bringing improvement in quality of products, firms in Panipat are not primarily dependent on organizational changes for quality improvement. Moreover, unlike Moradabad, there is no unidirectional trend of vertical integration in Panipat.

- Like Moradabad, firms in Panipat have introduced several market related changes and a large number of firms are operating through various commodity chains. But, while
Moradabad has started catering almost exclusively to the global market, a significant portion of the turnover in Panipat is still going to the domestic market channel.

- The comparative view of firm level survey of the two clusters suggests that technological changes in Panipat firms are even more demand driven than the Moradabad firms.

- Firm level technological capabilities in Panipat, though low, are higher than those in Moradabad. A considerable part of the technological capabilities of the cluster in Panipat industry is located in its production system. Deep inter firm division of labour, a characteristic which Panipat shares with European industrial districts, has contributed considerably towards its dynamism. Inter firm division of labour has helped in adoption of scale intensive new technologies which are undertaken by specialized stage producers, and has helped in fast diffusion of micro-electronic tools like CAD-CAM

- Presence of large number of activities in backward and forward links in Panipat presents the cluster with considerable opportunity of upgradation. Not only has the presence of machine good sector in Panipat made incremental innovation through the interaction between the users and manufacturers of machinery, it has also presented the cluster with development of Jugaru technologies

- As in Moradabad, the role of local trust relations in promoting technological change is non evident in Panipat, but the concern about secrecy is less pronounced in Panipat than in Moradabad. Role of trade associations in technological upgradation is even more dismal in Panipat than in Moradabad.

- One important factor contributing towards survival and growth of the Panipat cluster, which emerges quite clearly in several interviews, is the jugaru attitude of the entrepreneurs.

- The existing role of the government agencies in promotion of innovation and technological change in the clusters is weak.

- On the whole, Panipat Textile cluster has much higher level of technological dynamism as compared to Moradabad Metal Art-ware cluster. Over the last decade and a half, firms in the Panipat cluster have managed to promote and foster several technological changes including introduction of new production processes, diversification into new products, absorbing new techniques and machinery coupled with several organizational mechanisms in assimilating new manufacturing processes.
• On the whole, the textile cluster of Panipat can be considered as more technologically dynamic as compared to Moradabad, but it is far from reaching the threshold of international technological standards and practices. There persists considerable gap between the global best practices and those adopted in Panipat. In fact, the cluster is not even close to the national technological frontier.