This chapter presents the findings of research about innovation and technological change carried out in the Moradabad Metal Art-ware cluster. The chapter is divided in four parts.

The first part (section 4.1) presents a summary view of the cluster, focusing on origin, and evolution of the cluster and the structure and the organizational set up of the industry.

The second part (section 4.2) of the chapter is devoted to technological change and innovation. First section discusses the nature and extent of technological change taking place in the cluster; Process Change, Product Change, Raw Material Change and Information Technology Based Change. The hypothesis advanced is that the extent of technological innovation/change taking place in the cluster is not likely to be very significant (H1). Two other hypotheses tested in this section are: Cluster is likely to reflect the predominance of incremental or minor innovation rather than the radical or major innovation (H2); and product/raw material based innovation is likely to take precedent over process innovation in the cluster (H2a).

The second section of this part of the chapter discusses the relative role of the demand pull and technology push factors in stimulating innovation, and advances the hypothesis that demand pull is more important than the supply push in stimulating innovation in the clusters (H5). The strength of the demand pull is examined in terms of the sources of the market competition faced by the cluster firms; local, domestic (national) and international (global), and the nature of competition; price, quality and delivery schedule. The sub-hypothesis that new competition in terms of quality and delivery schedules exerts a greater pull than the traditional price competition (H5a) is also tested in this section.

The third section of part two discusses the factors which make technological change possible; the technological capabilities of the cluster. This includes discussion of collective or the cluster level technological capabilities, the firm level technological capabilities and the non-tangible capabilities located in various intra cluster links. The hypothesis that local knowledge
institutions in Moradabad are unlikely to have a major influence in building cluster level technological capabilities (H7) is also advanced in this section. In order to understand the dynamics of innovation resulting from intra cluster links, the social milieu of the cluster is discussed, with a special focus on presence/absence of trust in various socio-economic networks. The intra cluster links facilitating innovation include horizontal and vertical bilateral links between cluster firms. The links between firms and non-firm actors are also included. The section advances the hypothesis that the cluster is likely indicate a weak link between the presence of horizontal links and innovative activity (H8) and that cluster is likely to indicate significant presence of intra-cluster vertical links with a positive bearing on the innovative activity of clusters (H8a). This section also discusses the role of economic origins of the entrepreneur in leveraging the technological capabilities of the cluster. The role of government policies and government institutions is also examined in this part of the chapter. The hypotheses that the existing role of government in the promotion of innovation and technological change in Moradabad cluster is likely to be weak (H10) and that the role of the state/regional government agencies, vis-à-vis central government agencies is likely to be even weaker and have residual or very little impact (H10 a) are advanced in this section.

The forth section of part two discusses the contribution of sources external to the cluster; both national and international in the process of technological change. This section also looks at the dynamics through which the intra-cluster links are impacted by the strengthening of external links as a result of increasing participation of the cluster in the global market. The section advances the hypothesis that technological up-gradation of the clusters is positively associated with external links.

The hypothesis that the cluster is likely to indicate a positive relation between the firm size and the technological capabilities having a bearing on the innovative activity of the firms (H6) is also advanced in part 2.

The third part (section 4.3) of the chapter discusses the nature and extent of organizational innovation taking place in the metal art-ware cluster of Moradabad since 1991. The forth part (section 4.4) of the chapter discusses the nature and extent of market innovation taking place in the metal art-ware cluster of Moradabad since 1991. The hypothesis that the cluster is likely to indicate significant role played by organizational and market related innovation. (H3) is advanced in these sections.

The fifth and the final part (section 4.5) of the chapter carries discussion on the impact of innovation and technological change on two key development variables; growth and employment. The first section discusses the trends in the economic variables such as value of
output, value of exports, and profit rates. The second section includes a discussion on the trends in volume of employment and wage rate. The third section of this part reports the impact of technological organizational and market related innovations on the quality of employment. Quality of employment is studies with the help of parameters like age and gender composition of work force and the pollution levels. The hypotheses that the technological changes and innovation (including organizational innovation) taking place in the clusters are likely to have an important bearing in improving the total volume of employment and wage rate. (H11) and that technological changes and innovation (including organizational innovation) taking place in the two clusters are likely to have an important bearing in improving the environmental conditions of the labor (H11a) are advanced in this section.

4.1 SUMMARY VIEW OF THE MORADABAD METAL ART-WARE CLUSTER

The metal art-ware cluster of Moradabad is located in the district of Moradabad in Western U.P. The metal art-ware industry is spread over the city of Moradabad and its neighboring villages. The city of Moradabad is located on national highway 24, at a distance of about 160 km from Delhi. Though Moradabad is known as Peetal Nagri, (or the Brass Town), and is named as brass art-ware cluster in the UNIDO database, its industry is no more confined to production of brass wares. It has diversified to metals like aluminium, iron and steel to such an extent that it would be appropriate to call it metal art-ware cluster, instead of brass art-ware cluster. The cluster is the biggest center of metal art-ware products and has emerged as one of the most important centers for the export of Indian handicrafts. Though the city of Moradabad has been the most important center of the brass art-ware industry for centuries, the cluster has seen unprecedented growth in its output and exports in the post reform period.

4.1.1 Brief History of the Cluster

History of brass art-ware industry in Moradabad goes back to the Moghal period, during which the industry started, flourished and attained its zenith. During this period the city of

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141 The city is well connected with Delhi, Lucknow, Haridwar and Bareilly etc. Though the city of Moradabad, located on the banks of river Ramganga, forms the geographical core of the cluster, the industry is spread far beyond the limits of Municipal Corporation of the city. In the west the industry is spread on Sambal Road and in the south the it has spread in a big way on Delhi Road. According to one of the SDMs of Moradabad the brass exporter own virtually all land on the Delhi Road, right upto the city of Gajraula.

142 The industry is referred to as art metal-work industry by DC (Handicrafts) See DC (Handicrafts) 2001.
Moradabad experienced fast rate of commercialization and urbanization, and emerged as an important center for exports of Indian handicrafts.\textsuperscript{143}

\textbf{Map of Moradabad}

\begin{figure}[h]
\centering
\includegraphics[width=\textwidth]{map.png}
\caption{Map of Moradabad}
\end{figure}

The city of Moradabad came into being during the kingdom of Emperor Akbar in the 16\textsuperscript{th} century.\textsuperscript{144} But it got its present name from Morad, son of Shahjahan, the famous Moghal

\textsuperscript{143} The account of economic and social history of the cluster is created on the basis of diverse, and mostly informal sources, like discussions with a large number of persons belonging to families whose association with the brass-ware industry is centuries old. In particular, the accounts of Mr. Anwar of East Coast Industries and the then president of the BMAMEA, Mr. Jabbar, owner of Metal Products of India, Mr. Rahman, the owner of Anwar Kamal & Co, and Mr. Z.A. Mansoori, the president of PBDA were particularly helpful. Some material accessed from net, including, Zia Aziz (2000) were also used.

\textsuperscript{144}
emperor. Though brass was a familiar metal in the region in the pre-Moghal era, the industry acquired its ‘brass art-ware label’ only after the Moghals had started settling in big numbers in the region in the 16th century. According to A. K. Rahman, emperor Shahjahan had sent his forces under the command of his son Morad, to confront the menace of rehzons or the dacoits coming across Ramganga from the Rohailkhand region. When Morad moved in the region with his forces, his caravan had members of five working casts; cooks, butchers, barbers, tailors and ironsmiths, traveling with it. Services of ironsmiths were required for making and repairing the arms and amulets made from metal. Since sword handles and dastar band of soldiers had fine art work done on them, these iron smiths were well conversant in the metal art work. Some of the ironsmiths of Morad’s army got married to local brides and decided to stay back and work as artisans. Initially they started engraving on items of daily use. After some time they started making decorative luxury items like aftawa and shamadan etc. Gradually Moradabad grew as the most important center of finest handicrafts in brass. During this period the art of engraving, known kalam ka kam was refined to the level of almost a fine art. It consisted of as khudai and coloring known as rang Bahraini. Soya kalam ka kam; very fine engraving, became the main identity mark of Moradabad. Later on inlay work, done with semi precious stones, also became a part of Moradabad handicrafts tradition. Fine work with intricate Prussian designs from Moradabad was patronized by subsequent Moghal emperors like Abrader Shah Zaffar.

Unlike several other handicrafts, brass art-ware found considerable patronage from British rulers. During this period the exports of handcrafts from Moradabad grew at a fast rate. The industry grew at an impressive rate, both in the 19th century and the early 20th century, when Moradabad became the number one brass ware center, dislodging Varanasi. The last leg of the British rule saw significant acceleration in the exports from the cluster.

144 In 1624, Rustom Khan, the governor of Sambhal, captured the territory that has come to be known as Moradabad and named the city as Rustom Nagar. Sambhal, the region in which the present day city is located, has old history and finds mention even in Vedic literature as an important seat of Aryan culture and civilization. In the medieval period, Sambhal, one of the sub-divisions of the present day district Moradabad, became an important center of learning in Arabic and Prussian.

145 Thatera, an artisanal cast practicing metal work, used to make plain utility items like Iota and other utensils.

146 Rahman is the proprietor of Anwar Kamal and co, one of the oldest exporters of brass art-ware from Moradabad.

147 Brass grew in Moradabad at the cost of other metals. The industry attracted lot of migrants artisans from the neighboring as well as far of parts of the country, and a slow stream of migrants continued till 1947. The cluster became one of the finest centers for brass art ware. Soon it started exporting its fine art-wares to other parts of the world.
4.1.2 Cultural Factors

The social-economic tapestry of Moradabad is created by two main communities; Muslims and Hindus. The scene in Moradabad in pre independence period was dominated by Muslim owned units. Initially the industry was dominated by the members of working class Muslim communities like Ansaris, Saifs etc. It gradually attracted Ashrafs, who joined the industry; mostly in the entrepreneurial role. Shamsis, the Muslims who migrated from Panipat in the mid 19th century, also got involved in the industry in a big way. In the pre independence period the export scene was dominated by Ashraf Muslims. Two of the three biggest names in the cluster were of Muslim entrepreneurs; Moulin Yaar Khan and Hajji Kalian, Lala Basin Saran being the third name in the list. Hajjis travelling on Haj route used to forge trade links. Also several young men from the community traveled to European countries, forging direct trade links in the over-seas market. Earlier the educated members of the Muslim agrarian elite used to have a relative advantage vis-à-vis their Hindu counterparts on account of their knowledge of English language, and their greater international mobility. They used to travel a great deal, not only in Middle-East countries, but in Europe and the USA, forging direct links with the whole sellers in those countries.

Though social-economic tapestry of Moradabad is still woven by both the communities; Hindus and Muslims, a considerable change in its pattern has come about since independence. Though both the communities continue to be integral part of the economic division of labour in the industry, the dominance of Muslims has been going down over the decades in the post independence period. The partition of the country saw a convulsive demographic change. Over the decades migrants, mainly from Punjab, came to dominate the entrepreneurial class.¹⁴⁸

Though Muslim owned export houses continue to be important in Moradabad, the new market paradigm has tilted the scale against them. The old units, owned mostly by Muslims, suffer, among other things, on account of path dependency. A large number of these units are located in the hub of the old city, which has an aura of history. Most entrepreneurs coming from Muslim aristocratic class are hesitant to shift their premises on the much sought after Delhi Road. These entrepreneurs are the inheritors of the old legacy of the brass city and are proud to

¹⁴⁸ A look at the directory of Metal-ware Exporters suggests that nearly two thirds of all export units are owned by the members of the Hindu community, while one third belongs to the Muslim owners. However, since the share of Muslim owned units is much higher among very small units, (with less than Rs. one crore exports), the share of exports by Muslim owned units in total exports is even less; it is a little more than one quarter. This means that three forth of the internal value chain in Moradabad is organized by Hindu entrepreneurs.
be part of ‘great brass tradition’ and are comparatively slow in replacing brass with other metals. There are several other cultural traits/practices putting Muslims at a disadvantage in the age of globalization. Both the Muslim workers and entrepreneurs are perceived to be favouring a more relaxed pace of work. Most of them are particular about having five Namaz breaks in a day, having Friday as a holiday, and observing the rituals during the month of Ramzan. This, observed some of the exporters, obstructs the pace of work and is particularly unfavorable for meeting short delivery schedules. Increasing presence of agents of foreign buyers/buying agents is also putting the community at relative disadvantage.\(^{149}\)

However, to treat all of the Muslim owned units as a monolith would be a mistake. Muslim owned units can be sub-divided in three groups; the unit owned by the members of aristocratic families, originally belonging to the region, the units owned by Shamshirs or Shamsis, and the units owned by craftsmen turned exporters, belonging originally to the region. The traits of the second and the third category owners are quite different from those in the first category. Some of the most innovative firms in our sample belong to the third category. They have more professional style of management, and are in greater touch with specialized service providers and other institutions inside/outside the cluster. They are particularly good at introducing new products and raw materials.

Hindu exporters can be divided broadly in two categories; the ones settled in the cluster before partition and the others who came during/after partition. Among the first category are a large number of Hindi speaking entrepreneurs belonging mostly to the trading caste. This category includes some of the biggest exporters and the most innovative firms. By and large, these units have more conservative approach and are less networked with each other. In the second category there are, among others, a large number of Punjabi entrepreneurs, who over the decades have acquired control over a considerable part of the value chain. By and large, they are more networked among themselves as well as with other communities.

Considering the long history of the metal art-ware industry in the city of Moradabad, the cluster was expected to have high levels of ascribed trust, embedded on the social fabric. However like many other Indian clusters, Moradabad also has segmented trust relations. The segmentation is created both along the caste and the religious lines.

\(^{149}\) One of the exporters; owner of the unit claiming to be first one to export to USA, said ‘These buying agents are polluting our culture. They expect to be wined and dined till late hours. We can’t do all this because our religion does not permit. This puts us to a disadvantage in business. But we are happy that we are able to earn our bread and butter, sticking to our ground; ‘Ham kush hain ki ham apnea waqar par quaayam hain’.
There is, by and large, a divide between the workers and owners along the caste and religion lines. (i) While almost all the workers; Hindus and Muslims, belong to the working castes, the owners belong to mostly to the upper castes of Hindu or Muslim communities. (ii) While a considerable part of the value chain is governed by the Hindu entrepreneurs, most of the workers, specially skilled workers are Muslims.

**4.1.3 Developments in the Post Independence Period**

The process of fast social change in the cluster started at the time of partition, when a large number of Muslims fled from the city, while a large number of Hindus came and settled here. This brought a drastic change in the balance of economic power between two communities. In the pre-partition period while the members of Hindu trading community controlled trading of raw materials as well as finished goods, manufacturing was organized by members of the Muslim community. As per the official records, as late as the 1930s, Muslims constituted nearly 90% of all persons engaged in the brass ware industry of Moradabad.

The partition of the country saw a convulsive demographic change, which brought down the percentage of Muslims in the city from 61% to less than 50%. Partition also marked the beginning of an era of radical change in the organizational set up of the cluster. Moradabad, which was till then dominated by small HH (household) units, went on to become a cluster with highly hierarchical structure. Gradually, the industry started being dominated by merchant entrepreneurs. Though Moradabad did have a few important enterprises owned by merchant entrepreneurs in the pre-partition period, partition brought large number of merchant entrepreneurs migrating from the Punjab province of Pakistan. As in many other clusters, the partition migrants went on to become a very important part of the local economic scenario. These merchant entrepreneurs began to expand into overseas markets at a fast rate. The post partition phase saw a major spurt in manufacturing and exports from the cluster, even as the cluster saw major shake-up in its organizational set up. By the 1960s, the industry, which was almost entirely a cottage industry, began to employ a large number hired labour. 

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150 There is however no absolute bar created by the caste divide for the members of the working class of Muslim community. There are several craftsmen turned exporters, belonging to the working castes of the Muslim communities. Upward mobility of lower caste among Hindu artisans is however less common.

151 A visual evidence of this division of labour was seen by me during the field work. A painting hanging in the office of an exporter, which depicted a person with tilak on his forehead weighing metal, as a bearded client looked on.

152 According to a study by IDS (Industrial Development Study), while in 1960 the percentage of self employed workers was as high as 66%, it came down to a mere 1% in 1974.
saw a significant shift in the market orientation of the cluster with the share of exports in total
turn over of the cluster growing at a fast rate. Search of new oversea markets, like the USA,
meant that exports were no longer confined to traditional markets like the middle-east. This
trend of changing market orientation was strengthened by the dip in domestic demand for brass
utensils, as steel, plastic and other material started dominating that segment of the domestic
industry.

Emergence of unconventional markets, like the USA, also brought about a major shift in
the product mix of the cluster. The demand from new markets came predominately from the
mass market for life style products with much less emphasis on exclusiveness and artistic
character of the goods, rather than from the niche market of handicraft goods, which dominated
the exports to middle-east, and to a lesser extent to UK and other European countries. This shift
in the nature of demand exerted a big pull for change of technology. The technologies
favouring small batch production were fast replaced with technologies suitable for mass
production. Further the industry witnessed shift away from traditional molding (sand casting)
techniques to sheet work. Products made in large numbers, from brass sheets with the help of
simple lathe machines, started replacing items molded on tradition coal fired furnaces; para
bhatti or darja bhatti. Techniques of surface finishing also witnessed radical changes. Hand
performed activities like chhilai (scraping) and hand polishing were replaced with finishing
with the help of simple polishing machines. These machines could not be considered in the
category of creation of significantly new process technologies. Their adoption/diffusion in the
metal art-ware industry was a function of change in demand. These processes, though initiated
due to demand pull, would not have been possible, had there not been fast diffusion of
electricity in Moradabad in the post independence period. With the access of electricity to the
HH units, processes like welding also underwent change replacing electricity in place of
kerosene stoves. Electricity was also responsible for the fast diffusion of processes like
electroplating, which were to replace manual artistic processes like kalam ka kam, rangaii and
bharai.

On the whole, the change from manual to electro mechanical technologies that
Moradabad saw in the decades of 1960s onwards was more of a demand driven rather than
technology driven phenomenon. The period saw the beginning of the period of atrophy in the
artistic knowledge and skills, whose survival was to become increasingly difficult in the decades
to come.