



National Innovation Council

# **INNOVATION CLUSTER IN THE BRASSWARE INDUSTRY AT MORADABAD, UTTAR PRADESH**

A Case Study

**Based on the Innovation Cluster Initiative of the National Innovation Council**

**by**

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*January, 2013*

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## **Partners for the Initiative**

Moradabad Cluster Inclusive Development Society, Moradabad, Uttar Pradesh

CSIR – National Metallurgical Laboratory, Jamshedpur, Jharkhand

CSIR – Central Electro Chemical Research Institute, Karaikudi, Tamil Nadu

Metal Handicrafts Service Centre – Ministry of Textiles, Government of India, Moradabad, Uttar Pradesh

Infrastructure Leasing and Financial Services Ltd., New Delhi, Delhi

Federation of Indian Chambers of Commerce and Industry, New Delhi, Delhi

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The authors wish to acknowledge the contributions of Samir Mitra and Keerthi Laal Kala of the Innovation Cluster Initiative at the National Innovation Council for this case study.



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*Nita Sachan, Venkat Munagala, and Saswati Chakravarty (Indian School of Business, ISB) wrote this case study solely to provide a description of work carried out under the National Innovation Council's Innovation Cluster Initiative. The authors do not intend to illustrate either effective or ineffective handling of a managerial situation. The authors may have disguised certain names and other identifying information to protect confidentiality.*

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### EXECUTIVE SUMMARY

The Moradabad Brassware Cluster, in Uttar Pradesh, is mainly focused on the export market. The annual turnover of the cluster is over Rs 3,500 crore of which 80% is earned through exports of metalware, including brassware. The cluster has evolved from utilizing only brass a decade ago to now incorporating other metal alloys. Despite growth in the number of exporters in the cluster, there has been a significant decline in the number of artisans due to challenges in living conditions, wages, raw material procurement, prices and stricter international compliance norms.

Artisans form the backbone of the cluster and there is a dire need to improve their socio-economic conditions. The National Innovation Council (NInC) has facilitated pilot innovation interventions at the Moradabad cluster which are expected to impact the business economics for the artisan, manufacturer and exporter. Though there are multiple challenges at the ground level, including need for improvements in processes, infrastructure and skill development, NInC has focussed on facilitating the creation of an innovation ecosystem and the Cluster Innovation Centre (CIC) that is expected to address the long term challenges. The following study captures the challenges, evaluates the interventions and ecosystem map for the Moradabad brassware cluster.

### BACKGROUND OF MORADABAD CLUSTER

The genesis of brassware production in India can be traced back to the Moghuls from Persia in the 17th century who settled in Delhi. Indian brass handicraft is recognized globally. The articles include brass artware, furniture, brass figurines, giftware, decorative and other collectible items.

Moradabad is home to one of the oldest brassware clusters in India and is also called 'Peetal Nagri', meaning Brass City. The cluster has an annual turnover of Rs 3,500 crore of which exports stand at approximately Rs 2,700 crore which in turn is approximately 20% of the total handicraft exports from India<sup>1</sup>. According to local industry estimates, there are 1,200 registered exporters who outsource work orders to small scale manufacturing units who, in turn, employ the artisans. In some instances, the

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<sup>1</sup>Diagnostic Study of Moradabad art metalware cluster, prepared by IL&FS for NInC, 2008

exporters work directly with the artisans. The number of exporters has gone up to 1,200 from 850, a 150% increase from earlier. Of these only 4-5 exporters have an annual turnover of Rs 20 crore or more<sup>2</sup>. The cluster consists of 1,800 small scale manufacturing units, locally called karkhanedars, and 25,000 unregistered household units. In 2008-09, these units together employed 3,60,000 people<sup>3</sup>. According to local industry exporters, the number has now come down to around 1,80,000 artisans.

A UNIDO report indicates that in 2001 Moradabad exported Rs 4,000-crore worth of brassware. In 2006, the exports dropped to Rs 3,000 crore<sup>4</sup>. Due to various challenges discussed in later sections, currently only Rs 2,200-crore worth of various metal alloy products are being exported, of which brassware constitutes Rs 800 crore<sup>5</sup>.

As explained by Mr Nadeem, one of the leading exporters of the region:

*“The artisans or exporters who adapted to the changing trends of the consumer and shifted to making metalware from iron or mixed alloys like aluminium, have managed to survive. The rest have gone out of business.”*

The Moradabad cluster is made up of extremely diverse groups who have strong political affiliations and are highly polarized. The large number of associations and artisan representative bodies makes the environment complex and limits the scope for formal knowledge sharing practices. An intervention by the NInC to form a Cluster Innovation Center (CIC), which has been christened Moradabad Cluster Inclusion and Development Society (MCIDS), is expected to encourage the process of collaboration. NInC helped facilitate and seed the creation of both, a Cluster Innovation Centre (CIC), which would be an innovation hub for the local industry, and a common SME industry association, christened Moradabad Cluster Inclusion and Development Society (MCIDS). The mandate of MCIDS is to facilitate development of new programmes, products, services, collaborations and partnerships for the local SME industry benefit. The formation of MCIDS was geared towards bringing key players on to a common platform.

The MCIDS is expected to play a major role in collectively articulating the needs of various stakeholders of the value chain. Currently, there are disparities due to multiple voices and interest groups that tend to pull in different directions. Once fully operational, MCIDS is expected to be in a position to showcase the benefits of a common resource base and, thus be able to attract diverse players. It is also expected to play a critical role in focusing on collective innovations needs. This would ensure community participation and ownership of process and product innovations.

## **KEY CHALLENGES**

### **At Artisan Level**

#### a) Coal based furnace and living conditions

The coal based furnace creates not only harmful air pollutants but also ash. These create extremely squalid living conditions for the artisans and their families since most production units are based out of their homes. Hazardous air pollutants released during melting of brass cause increased respiratory diseases like tuberculosis and various forms of cancer amongst the artisans and their families. Coal used to heat the furnaces produces a lot of ash.

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<sup>2</sup> Diagnostic Study of Moradabad art metalware cluster, prepared by IL&FS for NInC, 2008

<sup>3</sup> NInC data, 2012.

<sup>4</sup> CSR Perceptions and activities of small and medium enterprises (SMEs) in seven geographical clusters, UNIDO, 2008

<sup>5</sup> NInC data, 2012

Mr Kamar Khan, an artisan says:

*“The ash content in the coal has drastically increased over the last 10 years. While the quality has gone down, the price has doubled”.*

b) Labour compensation

Poor wages is a major deterring factor for newer workforce to join the production units. The artisans get paid a compensation of Rs 26 per kg for the final product. Lack of basic infrastructure like power, combined with pollution, health hazards and poor remuneration are forcing artisans to opt out of the traditional profession.

**At Artisan & Exporter Level**

a) New raw material

Steep rise in the price of brass in the international market has led to drastic decrease in the demand for brassware. As a result, the manufacturers have adapted other metals that have a greater demand and have higher profit margins. While the price of brass has increased nearly 200% in the last 5 years, the price of aluminium has remained constant at Rs130 per kg. The cluster has, thus, evolved from a pure brass-based cluster to artware made of metal alloys–brass-glass, brass-wood, brass-ceramic, aluminium, iron/galvanized metal-glass/ brass/ wood amongst others.

In addition the newer alloys are preferred over brass since they are significantly lightweight. Both buyers and consumers prefer lighter metals, which makes handling convenient and also results in increased profits as the freight charges and subsequent taxes are lesser.<sup>6</sup>

b) Inadequate power supply

Inadequate and interrupted power supply has been a major cause of concern for operating the units at an optimal level. Electricity is essential for all stages of production-for scrapping, casting, sheet metal making, finishing and electroplating. On an average, the total effective power supply during daytime is only 4 hours despite overall power supply being 10-12 hour during the entire day. This makes it very difficult for the artisans to complete the required task. As a result, most of the artisans end up working late nights and at odd hours. In addition, the production units have resorted to utilizing power from diesel run generators. This has resulted in increased cost of production. The grid power costs approximately Rs 8 per unit while diesel generator power costs approximately Rs 14 per unit. This has increased the manufacturing cost of products, making them highly uncompetitive in the international and domestic markets.

According to Mr. Nadeem:

*“We are running completely on diesel generators. The high price of the power isn’t making the business viable. The heavy fluctuation in the electricity supply is taking a toll on our equipment”.*

c) Presence of cyanide in electrolytes

The electrolyte used for plating the brass metal ware contains cyanide, an extremely hazardous chemical affecting the health of the artisans. Also strict international compliance norms mandate that hazardous chemicals such as cyanide not be used. However, cluster members say that certain properties of cyanide make it hard to replace during the electroplating process.

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<sup>6</sup>CSR Perceptions and activities of small and medium enterprises (SMEs) in seven geographical clusters, UNIDO, 2008

As Mr Gaurav Ohri, a manufacturer and exporter and the secretary of MCIDS, says:

*“Cyanide is a critical component for electrolytes used in electroplating. The throwing power (ability to spread fast) of the chemical is very useful. It cannot be easily substituted.”*

d) Absence of formal credit channels to karkhanedars and artisans

Higher raw material prices, costlier electrical power and an increasing volume of work have created an increased need for capital. However, there are no established lines of credit or capital available to the artisans and karkhanedars.

**At Cluster Level**

e) Competition

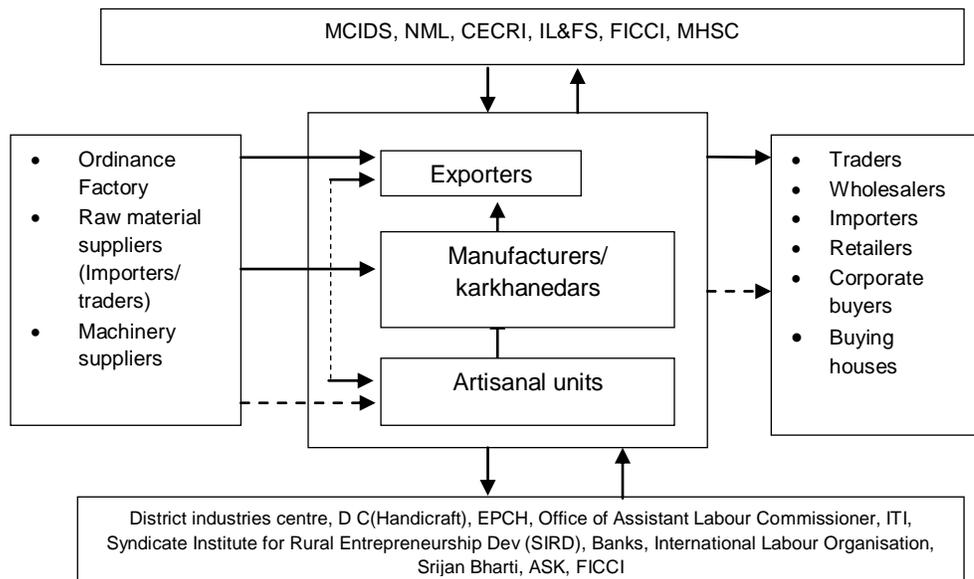
Other countries such as China, Thailand etc have produced alloys which are brass-like metals. These products are cheaper, lighter and do not tarnish. The Moradabad brassware cluster practices are centuries old hence they are struggling to compete with the superior quality global brassware products.

f) Marketing

Moradabad is located close to the national capital and very well connected by road. However, in absence of any structured marketing platform to show case the products and with the city being very unorganized, buyers are hesitant to visit the place. Suppliers have to visit Delhi to showcase their products to the buyers and take orders. A proper marketing infrastructure setup would enable Moradabad in attracting buyers and transform it into a sourcing hub.

**THE CLUSTER ECOSYSTEM**

The chain of work starts at the level of micro and household units (artisans). Larger workshops (manufacturers/ karkhanedars) sub-contract specific jobs to these micro units. The manufacturers receive



<sup>7</sup> Abbreviations

<sup>7</sup> MCIDS- Moradabad Cluster Inclusive Development Society, NML- National Metallurgical Laboratory, CECRI- Central Electro Chemical Research Institute, IL&FS- Infrastructure Leasing and Financial Services Ltd., MHSC- Metal Handicrafts Service Centre, FICCI- Federation of Indian Chambers of Commerce and Industry

their contracts from exporters, who source orders from international buyers such as retailers, catalogue companies, boutique stores, either directly or through importers or buying agencies. Typically, the product design is provided by the buyers. The artisan make the basic product after melting the raw metal, while most of the finishing including electroplating and polishing, is done by the exporters.

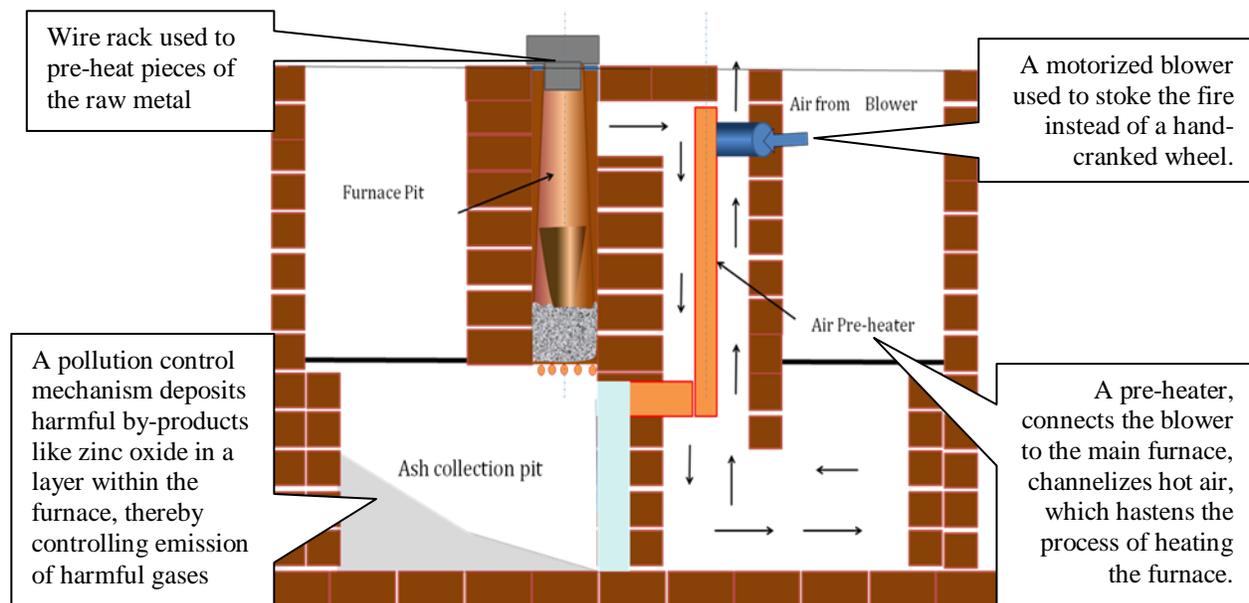
Earlier the various players in the cluster were collaborating sporadically, but concrete efforts to establish mutually beneficial partnerships and formal knowledge sharing practices did not exist. NInC's major goal was to bring the various stakeholders together on a common platform which aimed to bring economies for enhanced operational efficiency of the cluster.

NInC has also sought to strengthen the innovation ecosystem by bringing partners such as the Council for Scientific and Industrial Research (CSIR) on board to address the technological innovation needs of the cluster. The CIC is expected to play a critical role in maintaining healthy working relationships between the various partners and explore newer partnerships.

### PILOT INNOVATIONS UNDERTAKEN

#### a) Improved coal- based furnace

A new coal-based energy efficient furnace was designed to melt raw metal with improved energy efficiency and reduced pollution. The furnace was designed by the National Metallurgical Laboratory (NML), Jamshedpur, a Council of Scientific and Industrial Research (CSIR) lab. This new furnace is expected to improve efficiency, with 20% reduced consumption of coke/coal. Due to the increased production capability of the furnace, it is also expected to improve the productivity by approximately 10%. This improved fuel-efficient furnace with increased production capability, is anticipated to not only increase the artisan's income level, which is key for adoption of innovations by the artisans but also expected to provide socio-economic benefit.



**Schematic of modified pit furnace**

In addition, there is also reduced sulphur evaporation from the newly designed furnace which results in significantly reduced air pollution and controls emission of harmful gases. Continuous inhalation of gases

and particulate matter in the exhaust, such as zinc oxide can cause life threatening diseases such as tuberculosis and cancer. A moderate sized furnace costs approximately Rs 3,000.

According to Mr. Kamar Khan, the artisan using the newly designed furnace:

*“The furnace catches fire faster and we can now melt more brass faster. It has helped us, so far, to produce five more pieces in a day. Also, the gas emitted is less”.*

b) Ready to use lacquer

Lacquer is sprayed on finished products to protect the metal surface from environmental damages and increases the shelf life of handicraft. An efficient lacquer has been developed in partnership with CSIR-NML. Usually lacquer is mixed with hardeners and/or thinners. It requires 30 minutes of baking and 60 minutes of drying and can only be sprayed. In comparison, the new ready-to-use lacquer requires minimal addition of thinner, does not require baking and requires only 30 minutes of drying, resulting in a major savings in application time. It can either be sprayed, dip coated or brush painted onto the metal surface.

As explained by Mr Gaurav Ohri:

*“Since power supply here is not reliable, small units don’t have ovens or baking facilities. More than 80% of the lacquers in use need to be heated under high temperatures, which is not possible without power. The lacquer developed by CSIR-NML is trying to solve this problem. Moreover, the lacquer needs no mixers before use and can be stored for 2 years.”*

c) Cyanide-free electrolytes

A cyanide-free brass electrolyte is being developed by the Central Electrochemical Research Institute (CECRI), a CSIR lab. The new electrolyte is expected to replicate the earlier cyanide containing electrolyte's coating properties, however without its toxic effects. This would provide the artisans a cleaner, safer environment and meet international standards.

## **IMPACT AND WAY FORWARD**

Once the newly designed energy efficient furnace is implemented on a larger scale, it is expected to have a much larger impact on the cluster economics. Due to increased productivity and efficiency, the income of the artisans is expected to grow substantially. Individual units can be easily trained to assemble these furnaces which are extremely affordable and cause reduced air pollution. Exporters and manufacturer-exporters have expressed interest in investing in such furnaces.

Both the innovation initiatives – the furnace and the ready-to-use lacquer – are recent developments. The new lacquer technology is expected to benefit the exporters who need to comply with strict international norms and the finished product can fetch higher prices. The cyanide-free electrolytes are expected to protect the artisans from the toxic health-related side effects of cyanide. CSIR plans to transfer the technology for these innovations to the micro and small enterprises while CIC would ensure that all cluster members get the benefits in a sustainable manner. MCIDS is expected to facilitate the creation of an enterprise to successfully commercialize the transferred technology. The effectiveness of these innovation programmes depend upon effective technology transfer and commercialization of these innovations.

MCIDS, a non-profit organization, is currently facing some teething troubles. The polarized atmosphere and split loyalties to artisans and exporters makes the task daunting. The stakeholders at the cluster need to have a collaborative mindset for taking forward the CIC initiatives for the development of the cluster. This is all the more important as the CIC is initially seed funded on a public-private partnership model and its growth, development and role has to be determined and maintained by the association.

## MORADABAD BRASS CLUSTER KEY INTERVENTIONS AND IMPACT

ACTIVITY	PRE-INTERVENTION	EXPECTED IMPACT	BENEFIT TO	WAY FORWARD
Formation of Cluster Innovation Centre	<ul style="list-style-type: none"> <li>• Diverse interest groups</li> <li>• No knowledge sharing practices</li> <li>• No identification of common issues</li> </ul>	<ul style="list-style-type: none"> <li>• Articulation of collective needs</li> <li>• Showcase benefits of common resource base</li> <li>• Community participation and ownership</li> </ul>	Cluster	<ul style="list-style-type: none"> <li>• Reduction of internal differences necessary</li> <li>• Encourage ground-up collaborative activities</li> </ul>
MCIDS	<ul style="list-style-type: none"> <li>• Diverse interest groups</li> <li>• No identification of common issues</li> </ul>	<ul style="list-style-type: none"> <li>• New organisation mechanism to focus on common needs</li> <li>• Identification of common R&amp;D needs</li> <li>• Scalability of innovative practices across all SMEs</li> <li>• Socio-economic benefits</li> </ul>	Cluster	<ul style="list-style-type: none"> <li>• Community ownership of ideas and processes</li> <li>• Co-operative organisational structure needed</li> </ul>
Newly designed coal furnace	<ul style="list-style-type: none"> <li>• Release of harmful air pollutants</li> <li>• Exposure to health hazards like TB and cancer</li> <li>• High ash content in coal</li> <li>• Limited productivity</li> </ul>	<ul style="list-style-type: none"> <li>• 20% reduction in fuel consumption</li> <li>• 10% enhanced productivity</li> <li>• Expected to increase wages due to increased productivity</li> <li>• Healthier working conditions</li> <li>• Affordable Furnace</li> </ul>	Artisans Manufacturing units	<ul style="list-style-type: none"> <li>• Large scale implementation needed for greater economic benefit</li> <li>• Technology transfer and commercial launch</li> </ul>
Ready to use lacquer	<ul style="list-style-type: none"> <li>• Needs to be mixed with hardeners or thinners</li> <li>• 30 minutes of baking</li> <li>• 60 minutes of drying</li> <li>• Can only be sprayed</li> <li>• Cannot be stored</li> </ul>	<ul style="list-style-type: none"> <li>• No baking time</li> <li>• 30 minutes of drying time</li> <li>• Can be sprayed, dip coated or brush painted</li> <li>• Major saving in application time</li> <li>• No wastage as it has long shelf life</li> </ul>	Exporters	<ul style="list-style-type: none"> <li>• Transfer of technology and commercial use</li> <li>• Product needs to be popularized in the cluster</li> <li>• Benefits need to be propagated</li> </ul>
Cyanide-free electrolytes	<ul style="list-style-type: none"> <li>• Serious health hazards</li> <li>• Hard to comply with global norms on usage of harmful chemicals</li> </ul>	<ul style="list-style-type: none"> <li>• No toxic effects</li> <li>• Help meet international quality norms</li> <li>• Cleaner &amp; safer for users</li> </ul>	Artisans Exporters	<ul style="list-style-type: none"> <li>• Need to replicate the property of cyanide to spread quickly</li> </ul>