# Knowledge Sharing in Industrial Clusters: Cases from India, Germany and Italy

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**Abstract**

The present paper highlights the major characteristics of industrial clusters in different culture areas of India, Germany and Italy as to how these are tackling the issues of innovative activity through knowledge sharing, transfer and cooperation. How these can learn from each other in a cross-cultural context. How a regional cross-cultural virtual network could be built up to create a constant learning environment and promoting innovations in this highly competitive globalized world.

## Introduction

The present day knowledge economy demands knowledge intensive enterprises, which only can survive in the ongoing process of globalization and increased international competition. As knowledge resides only in the human mind, it can only be harnessed by focusing on increasing human capabilities through the process of increased communication, cooperation and linkages, both within the enterprise as well as across enterprises and knowledge producing organizations. As the countries integrate into the global village, these enterprises, particularly, Small and Medium Enterprises (SMEs)[2] will have to respond accordingly and thus deserve special attention. To enable SMEs to mitigate problems of technological backwardness and enhance their access to new technologies, it is imperative to give them a conducive environment with tacit knowledge playing a predominant role. One of the most successful innovations is the concept of industrial clusters. The experiences in different countries show that clusters of enterprises provide a better environment for knowledge sharing and transfer because of the proximity, mutual trust and common goal of the enterprises. In industrial clusters, one can see that the town and its population whether young or old, rich or poor, are working like one big-networked company. Cluster like

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[2] SMEs in India are enterprises with investment ranging from Rs. 2.5 million to Rs. 10 million and manpower ranging from 25 persons to around 400 persons.

companies have their own lives, their own rise and fall but importantly they stay together for longer periods. The cluster concept has proved to be helpful in building local capabilities, competence building, public private partnerships, skill up gradation, technological development and a host of other aspects necessary for the growth of SMEs. There is increasing agreement that clustering helps small enterprise to overcome growth constraints and compete in international markets (Nadvi & Schmitz, 1999). To achieve these objectives, knowledge sharing in enterprise units in a cluster has come to occupy a central place. While these have been highly successful in Germany and Italy, much needs to be done in the Indian context. What are the factors, which need attention to make Indian clusters more dynamic? What we can learn from other culture areas? What policy measures are required at national level? How SMEs in clusters can share and transfer knowledge and information effectively to enhance innovative capabilities and cooperate in an increasingly competitive environment.

This study is based on interviews conducted at Ahmedabad, Gujarat, India; Aachen region, Germany, and Bologna region, Italy, carried under the EU-India Cross Cultural Innovation Network Project. The study is divided into five parts. Part one discusses the achievements and challenges faced by Indian Small and Medium Enterprises (SMEs) and adoption of a cluster approach to achieve the above objectives. Case studies of clusters of Oil engines in Rajkot, Gems and Jewelry in Surat, and Ceramic Clusters, Ahmedabad, Gujarat, India have been discussed. Part two discusses the German Model for innovative SMEs through constant learning with strong academia – enterprise linkages. Part three discusses the Italian Model, as to how small enterprises in the Bologna region cooperate and compete internationally. Part four highlights the unique features of clusters in different culture areas and what lessons can be drawn. Part five concludes.

## 1. The Indian Clusters

In India, at present, there are about 138 major clusters which are engaged in specialized industrial sub-sectors such as: locks at Aligarh, leather footwear at Agra and Kanpur; cotton hosiery at Calcutta and Delhi; blankets in Panipat; power looms at Bhiwadi; diesel engines in Rajkot, diamond polishing in Surat.

Space bound "dense clusters" related to a specialized industry are even more pronounced in the State of Punjab with woolen garments, bicycle and bicycle parts, sewing machine parts and machine tools in Ludhiana; printing and printing goods, water pipes and bathroom fixtures in Jallandhar; foundries in Batala, etc. Of these, the one at Ludhiana is one of the very successful clusters, having a wide range of diverse products building on “mechanical” skills , which include sewing machines parts, bicycle and bicycle parts, auto parts components and machine tools. Ludhiana is also better known as the Manchester of India, which alone contributes to the production of 95% of the country’s woolen knitwear, 85% of country’s knitting machines and 60% of the nation’s bicycles and bicycle’s parts. Agra cluster makes 0.15 million pairs of shoes per day with a production value of 1.3 m US$ and exporting shoes worth US $ 57.14 million per year (Juneja, 1998). Knitwear cluster in Tiruppur, Tamil Nadu is responsible for 85% of Indian Market and its export earnings have expanded from US$ 25 million in 1986 to US$ 636 million in 1997. What is interesting about Tiruppur cluster is that it is organized in a web of small work places through which the entire town works like a living industrial organization (Chari, 2000). Here we present three detailed case studies of clusters relating to Diesel Engines in Rajkot, and Gems and Jewelry Cluster in Surat, and Ceramics Cluster near Ahmedabad, all located in the Gujarat region in India.

### 1.1 Case – 1: Diesel Engine Cluster-Rajkot, Gujarat, India

Rajkot Diesel Engine Industry is the leader in Indian Diesel Engine market with more than 60% of India’s total diesel engine production. It accounts for around 0.3 million diesel engines per year valued around Rs. 2500 million with sizes from 3.5 HP to 20 HP. Majority production is in the range from 3.5 HP to 8 HP. State wise production is given in Table 1. The industry is made up of small-scale manufacturers and has about 400 foundry units in the city. Their annual production is more than one hundred thousand tones of casting. It employs more than 40,000 workers. The cluster is a network of units manufacturing different components of the diesel engines and the units assembling the components to get

finished products. Thus the network of suppliers and buyers is within the cluster itself.

**Table 1: State wise concentration of diesel engine manufacturing units:**

| **State and place of concentration** | **Percentage of concentration of unit** |
|---|---|
| Gujarat – Rajkot | 60 % of production consisting of high speed and slow speed diesel engines |
| Maharashtra – Pune, Kohlapur | 15 % |
| U.P. – Agra | 15% |
| M.P. – Indore | 5 % |
| Other states (Tamilnadu – Coimbatore, Punjab – Few pockets) | 5 % |

Of the above State's concentration, Rajkot in Gujarat is the major production center of slow speed Lister type diesel engines and caters to the irrigation demand, which constitute 75% production of Lister type diesel engines and remaining 25% goes for other purpose like concrete mixtures crushes, sugar cane crushes, flour mills, etc. Interviews conducted with the selected entrepreneurs (fifteen) associated with this cluster highlighted a number of features:

The entrepreneurs are working without any support from the outside sources for incremental technological inputs. Their knowledge loop / network is limited to entrepreneurs themselves, and try to find solutions to their problems from inside. Improvements were made based on the knowledge and information available within the cluster. For acquisition of new knowledge an association called Rajkot Engineering Association (REA), helps to keep them updated with the latest information and also takes care of raw material supplies and bulk buying.

Major use of the cluster is made for the maintenance of relationship and but ironically shall not share information or knowledge. The family will not share any new information with the other family groups, which may also be the part of the same cluster. The entrepreneurs in the cluster belong to the same community or class or caste due to which they follow similar type of business policy and overall business pattern (Phansalkar, 1999). There is competition, conflict, rivalry

and cooperation all together in the day to day business. The strong sense of family, and cast, and linguistic and regional identities greatly influence the determination of business objectives and focus. Due to these community–caste–linguistic groups of entrepreneurs competing with each other, the result is an imperfect market nurturing dominant coalitions of firms by particular communities.

### 1.2 Case 2- Diamond Processing Industrial Cluster- Surat, Gujarat

Gems & Jewelry (G&J) is another industrial cluster in Gujarat, which has displayed great innovation at small enterprise level. G&J industry is second largest foreign exchange earner in India and concentrated in south Gujarat with number of small scale units engaged in diamond processing, doing innovations locally to serve 80% of world's diamond market. The total export by this segment in the year 1999-2000 was approx. US $ 6500 million, which is about 16% of India's total exports of US $ 35 billion. The industry has been growing at 15-17% annually since last few years.

The G&J industry in India is structured as diamonds, jewelry and precious/semi precious stones (Figure1). These segments are further divided into sub segments. However, diamonds dominate the total G&J exports and contribute US $5.5 billion, which means about 81% of the total exports by the industry.

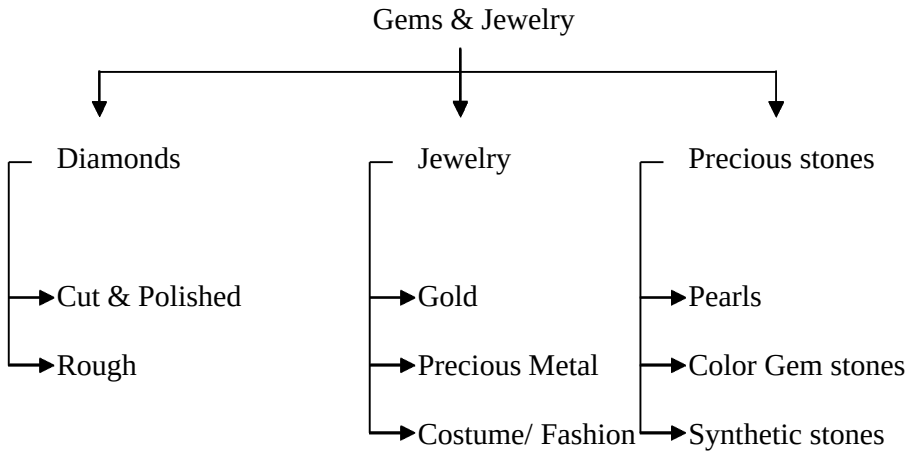


**Figure 1: G&J Industry Structure in India**

G&J industry in India is labor intensive and employs over 1 million people, which indicates its massive socio-economic impact on Indian sub-continent. The industry is mainly fostered in Gujarat, Maharashtra, Uttar Pradesh, Rajasthan, Tamil Nadu, West Bengal and Kerala. In this Diamond has lion's share in Indian G&J exports. Export of cut & polished diamonds is almost 81% of total gems & jewelry exports. India is considered to be one of the world's largest centers for cut & polished diamonds. Indian cut & polished diamonds account for about 45% of international diamond production in value terms & 70% in terms of carats. It is the main center for processing of diamonds, i.e., making cut & polished diamonds from roughs, processing about 100 million Carats of rough diamonds against the worlds total output of 117 million of rough diamonds. Out of every batch of 10 diamonds made in the world, 7.5 are made in India. It shows that India has established itself as the world's largest diamond processing center. In India, the diamond processing units are mainly located in Gujarat, particularly in Surat, Navsari and some parts of Sarasota & north Gujarat region. About 80% of country's diamond processing work is being done in Gujarat, out of which more than 50% is conducted at Surat only, and is thus also known as the diamond city of India.

According to the survey conducted at Surat by Keyoor Purani (2000), there is high amount of innovation in this cluster. The innovativeness is characterized as under:

- The diamond industry has developed unique aspects in developing Dynamic/ Diverse (D/D) product-mix to meet worldwide demands, customer tastes & preferences.

- Product innovations have been made by improvement in its cut, carat, color and clarity. Through unmatchable skills in cutting & polishing, there have been a variety of new cuts the Indian industry has been able to produce.

- India which uses non-perfect diamonds like polycrystalline, macles, distorted crystals, 'near gems' or 'near industrials', processing is not easily amenable to automation in contrast to Israel and has developed machinery to suit these applications as also to take advantage of cheap skilled labor.

Indian entrepreneurs have, to their credit, indigenously developed laser kerfing and sawing machines.

- The entrepreneurs have unique way of acquiring skills. The skills are passed on from generation to generation and identification of roughs, cutting, polishing and even marketing skills are inherited by people from their senior family members. By 'learning by doing'.

- Thousands of small units work in cooperation. As 95% of the units are clustered around Mumbai & Surat, they are more complimentary than competitive.

**1.3 Case 3-Ceramic Clusters, Ahmedabad**

There are 950 Ceramic units in ceramic clusters in Gujarat and all are family based. Most of these clusters are poor in knowledge but have high entrepreneurial spirit. To serve these cluster units and to cater to the needs of the developing ceramic industries in the small-scale sector of Gujarat and adjoining areas, Central Glass & Ceramic Research Institute (CGCRI) Naroda Centre, Ahmedabad, one of the constituent laboratories of the Council of Scientific and Industrial Research (CSIR) was established in 1977. To improve the skills in these units, training and manpower development programme were initiated in 1978. The Institute has so far conducted 32 technology development programmes and has trained about 600 artisans from the cluster. It has also conducted three entrepreneurship development programmes for encouraging new enterprises. The clusters at Morbi, Himmat Nagar and Mehsana etc. have benefited a lot in technology development from CGCRI, in terms of improving the quality of the raw materials for the manufacture of ceramic tiles, rural pottery and in improving process control parameters. Some of the important achievements of the Institute are:

- It has been able to use the Fly ash (a highly polluting waste product of thermal plants) in the manufacture of Ceramic tiles. Ceramic tiles now contain 30% of the raw materials as fly ash.
- It has also been able to produce blue ceramic tiles, which are free from lead.
- Ceramic filter candles have been developed which also contain 20-30% of fly ash.
- Cotton wick of the kerosene oil lamp has been replaced by the permanent ceramic wick, which need not be replaced at all.
- It has developed the technology for production of Bone China utilizing the China clays of Gujarat. This technology has been

transferred to 21 units in the small-scale sector including M/s. Anil Ceramics, Mori; M/s. Hitari Ceramics, Himmat nagar; the 'Sonya Ceramics' in Ahmedabad and M/s Ideal Ceramics, Delhi. The training of the workers is carried on the site, which has received very encouraging response.

The case studies above bring out that the cases of 'Gems and Jewelry' in Surat and 'Ceramics' in Ahmedabad, conform to the ideal picture of a cluster i.e. these are engaged in sharing of knowledge, skills, materials, equipment, finance and management to be innovative and internationally competitive. But in the case of Rajkot diesel engines, it was not active in terms of generation and acquisition of new knowledge which is necessary for constant technological change and innovations.

## 2. The German Model of Entrepreneurial Innovations

The German experience shows successful networked *enterprises as regional subsystems* because they realise networks as an efficient form of organisation. The whole specified region acts as a vast cluster with strong networking. This *co-operation integrating competition* enables the enterprises to survive and strive in a world that is continuously growing competitive. These aspects are clearly illustrated by the Aachen experience.

### 2.1 Case 1-The Aachen Experience

In Germany, the Aachen region has been described as the Learning Region, as it has a unique network of academia and the enterprise for continuous innovations and transfer of technologies from academia to the enterprise. The Aachen region is a big cluster of 8000 companies, four universities, 20 R&D institutes having 50-400 researchers each. Main research areas are lasers, ceramics, car engines, plastics, software & communications. The two main universities out of the four are University of Technology (RWTH) and University of Applied Sciences. The University of Technology has about 30,000 students and is mainly engaged in research on engineering and basic sciences and imparts Masters and Ph.D. degrees. It is mainly financed by the State. The departments have well known for

taking up projects from enterprises on a large scale. For example its Department of Computer Sciences in Mechanical Engineering takes up projects mainly from enterprises for its PhD research. The University of Applied Sciences has around 10,000 students It primarily takes up the projects from the industry, building a strong linkage between the university and the enterprises within the region. Apprenticeship development integrated with school-based training is the another characteristic of the region which has more than 100 schools, which import such combined school-apprenticeship training to about 10,000 students.

*Linkages among enterprises and the academia*

An outstanding feature of RWTH is its linkages with the enterprises. Several months of industrial internships are for instance a condition of admission to the final examinations for engineering students, whilst all the University's engineering curricula include project work, which usually comprises the investigation of a practical problem using scientific methods. Professors in the engineering faculties typically have strong personal links with industry, often going back to work experience of their own in industry prior to their University appointments, and these are often invaluable in setting up applied research projects of mutual interest to both parties. On the basis of contractual co-operation agreements with the Aachen Chambers of Industry and Commerce as well as with the Aachen Chamber of Craft and Art, a multifarious network of University-specific business contacts has evolved in the course of time. A considerable proportion of new businesses in the Aachen region are spin-offs resulting from research staff moving from the University to the private business sector. The University itself has again and again played midwife to any number of new enterprises. More than 80 per cent of the new enterprises launched in the Aachen Technology Centre (TZA) since 1984 have originated from the immediate environment of Aachen University of Technology.

*Spin-off Enterprises*

The spin-off enterprises from the university have been the major feature in the Aachen region. The Enterprises in Aachen region are basically divided into three groups:

- High Technology enterprises,
- Art & craft enterprises, and
- Low technology enterprises.

High technology enterprises are highly automated with lasers and computer aided automatic machines manufacturing for example, computer parts like modems and computer peripherals. The Art & craft enterprises are the enterprises with mix of modern and traditional technologies in the building and service sectors as well as producing furniture and other household goods. The low technology enterprises are basically in the area of recycling, meant to increase employment opportunities. Most of the people employed in the third group are from Asian countries. Prof Dietrich Brandt highlighted how the University of Technology was helping students to work on industry-oriented projects for their PhD work and to set up close relation with the enterprise. Many enterprises have recently run into economic difficulties in Germany. Even well known enterprises like Krantz Co. producing air conditioning systems have encountered serious difficulties, as they have to pay high salaries to their employees in Germany. They have shifted their production systems to the European and global areas where labour is cheap, and are now only concentrating on design and prototype development in Germany. Workers in these companies are being reduced on a large scale. Thus, due to this shift, overall unemployment has increased over the years from 5% in 1974 to about 12-13% on average in Germany as at present. To counter this situation in the Aachen region, the present emphasis is on promoting small enterprises with close connections with the university. A large number of small companies are being created to fight unemployment. One of these companies "Relektra" is in the area of recycling of electronic products, particularly computers, washing machines and television sets etc.

**2.2 Case 2-The Schell Gruentechnik Cluster**

Within the Aachen region, the case of The Schell Gruentechnik, is the classic example of an entrepreneur emerging from a traditional craft enterprise and promoting innovations in the manufacturing of heavy–duty lawn mower systems

through university–enterprise cooperation and forming a cluster for the components of the lawn mower systems. Franz Josef Schell who is the owner of the company, after obtaining Apprenticeship Diploma in Mechanical Engineering, gained experience in another big company for maintenance of lawn mowers and thus started his career in 1971 with maintenance and repairs of such lawn mowers. Slowly he started making his own spare parts for repair of lawn mowers. With the experience gained, he started making his own lawn mowers in 1981 and in 1991 it grew to 10-21 employees. Four of the employees are from his family members. The sales rose to 1 million US dollars and in the year 2000 it rose to 5 million US $. The yearly rate of growth of the company has been 20-25%. In 1998 it had linkages with the university for improvements in aerodynamic and hydraulic systems. The main problem to be solved was the aerodynamics of high-speed grass cutting and removing it out of the maelstrom inside the housing close to the ground underneath the lawn mower. This problem was solved by the company in close co-operation with the Department of Aerodynamics and Aircraft Design of the University of Technology, Aachen. The solution comprises the cutting-up of the grass into sufficiently small bits, which can be left on the lawn to rot and fertilize the ground. Today about all leading lawn mower producers worldwide buy the Schell mowing systems to attach them to their own brands of lawn mowers. The next step of technological development will be the remote-controlled and un-manned automated lawn mowers. The characteristic feature of the company is that not all parts or components of the lawn mower are made in the enterprise. Some 20% low-tech parts are obtained from China and about 50% parts are obtained from local and regional suppliers. Around this company, there are about 10 more companies, which supply these components. About 30% of the components which are particularly high tech components are manufactured in the enterprise it self.

## 3. The Italian Model of Innovation

Emilia-Romagna in Italy is the characteristic model of innovative SMEs in Italy, and is also known as the Third Italy. The productive system is characterized by Small and Medium-sized Enterprises (SMEs) (employing an average of 5.48

people per enterprise), with a huge number of artisan enterprises (126,639 out of 304,947) and co-operatives (7,923, including 2,336 farming co-operatives and 1,187 labour and manufacturing co-operatives). The major companies of the region are Barilla and Parmalat in the food sector; Ima and Tetrapak in the industrial machinery sector; Lamborghini and Ferrari in the motor vehicle manufacturing sector; and Ducati Motor in the motorbike sector.

### 3.1 Case 1- The Emilia-Romagna region

A very low level of vertical integration characterizes this region. It is, in fact, rare for a single firm to undertake a complete production process. Even major firms, which supply final goods, usually carry out only certain productive processes and leave the rest up to other firms. A complex network of suppliers has thus developed each undertaking a single production phase often on behalf of different firms. As a result, every supplying firm, however small, may maximize its level of specialization, knowing that it can rely on a sufficient number of orders to pay off the cost of technological investments. This particular form of organization of production has moreover created room for the development of complementary businesses, which distribute raw materials and semi-finished goods among suppliers and even larger firms, which manufacture machine tools. Constant exchange of information, helps to produce the product to individual specifications. There is thus high degree of flexible specialization.

One of the main features of this success has also been that, the SMEs of Emilia-Romagna region has set up associations to promote exports and form business alliances. For example the Emilia-Romagna Regional Federation of the National Confederation of the Craft and the Small and Medium enterprises (the Emilia-Romagna CAN) represents and defends all interests of craft firms, of small and medium enterprises and atypical workers in relations with public Administration, and with political, social and economic organizations. It seeks to promote their growth in an open competitive environment, permitting the best to exploit their full managerial and enterprise potential and skills. It works at local, regional, national and regional level (Europe-wide) and is rooted in both Italian and European cultures.

### 3.2 Case 2- "CENTURIA" Science and Technological Park (CSTP), Cesena

Cesena is at the heart of the Emilia Romagna region, and forms a link between Northern and the Central Italy and between Italy and the Central Europe. With a population of 1,80,000, Cesena's economic prosperity looks to the future through vigorous competition with other most developed areas in Europe. Its geographic location, acting as a pivot between central Italy and north Eastern Europe, offers a wide range of opportunities for trade and exchanges. Cesena's economic prospects are based on technological innovations and to the quality of both products and services. For this purpose linkage between the university, research centres, international trade fairs and science and technology parks are at the forefront. The "CENTURIA" Science and Technological Park" located in this region, in particular, has helped to bring together the leading companies in the food sector to foster research and innovation, through synergies with the Bologna University and other scientific institutions. A large number of research laboratories work in conjunction with the university. The CSTP which benefits from the participation of major local industrial groups, is active putting companies into direct contact with scientific and technical expertise of research institutes and the university. With this, Cesena has become a basin for agro-industrial expertise and experience with no equals in Europe in terms of concentration and achievements.

The main objective of the (CSTP) is to enhance the competitiveness of SMEs in this agro-industrial district of Romagna. It has been specifically created for agro-industrial technological innovations in this region of Cesena. This district has developed from a traditional agriculture region to an advanced high tech agro-industrial region with robotics, food processing machines, fruit sorting and packaging machines, logistics and transportation and application of biotechnology. The three main areas of activity are Poultry farming and animal feed: Sugar production; Fruits and Vegetables, with about 1000 SMEs and 15000 employees in total and a total turnover of 4 billion US$. About 40% of the profit go to the Consortium and 60% is distributed among the farmers. The co-operative

helps the farmers in all operations from plucking to packaging. Poultry farming has today become an integrated system whereby the industrial groups of Cesena control the entire process from feed farming, right up to meat processing. The cultivation of sugar beet is linked to the large sugar industry (the second in order of importance in Italy). The road transport sector has consolidated into a park of over three thousand specially equipped vehicles connected by satellite and sophisticated system of telecommunications.

- It has linked up 24 leading SME companies specialized in agro-industry with the local faculties of the University of Bologna, research centres and the local government municipality, Chamber of Commerce, Local health and environment authorities. The companies own 65% of the capital share.

- It serves as a data bank for information on patents, new technologies, and partnerships in R&D projects, technology transfer and joint ventures enhancing cluster visibility towards new investors. It thus helps in the establishment and management of a system of relationship between SMEs, universities and R&D centres, banks and associations and major industrial groups. These relationships have built up on the basis of contact research between companies and universities, and through joint projects in production development and common market between different companies. It helps the SMEs in project management, data mining, market analysis; technology transfer, new business start up in new geographical locations and arranges for venture capital.

- Information technology is playing a crucial role of, not only to create a network for better communications but also to upgrade the local companies technologically – like automation of production processes with the use of CAD – CAM techniques, and also to robotize the movements of articulated systems of fruit processing machinery. This STP has global networking, having linkages with International Association of Science Parks (IASP); Innovation Relay Centre North-East, Italy; Euro link Partners; Associazione Parchi Scientificie Technologici Italiani; and Agro-Consortium for Human Resources Educationin Agribusiness.

## 4. Discussion

The characteristic feature of the German and Italian innovation models is the establishment of a proactive entrepreneurial culture by forging strong linkages/networking between the enterprise and the universities/R&D institutions, through the creation of clusters Consortia, and Science and Technology Parks

such as in Cesena and Ravena regions in Italy. Aachen region in Germany is itself a big conglomeration of enterprises, academic institutions and universities with very strong networking. In case of German model there is strong state involvement through the workers' unions to impose on the universities to do applied research related to the industry. In a way the linkage between these two components is forced by the State. Similarly in Italy, Emilia – Romagna Regional Federation defends the interests of SMEs to promote their growth in an open competitive environment, permitting the best to exploit their full potential and skills. It also helps to inculcate entrepreneurial activities as in the case of Aachen All these approaches have been highly successful in consolidating the SMEs with infusion of high technologies and constant learning process with the academia. Vocational training has been one of the characteristic features of the German model. Co-operation and competition among the SMEs have been the crux of success in both German and Italian models, although it is also evident in the Gujarat Model of Innovation in India to some extent. Exploitation of all knowledge resources including international, national and local (to capture the tacit dimension), through networking with the help of information technologies has been recognized as the prime factor for integrating local knowledge with globally available for attaining competitive edge. In India, although academia-industry linkages have begun to emerge in various clusters, but India needs further large scale commitment and action on the lines of Consortia and conglomeration of SMEs in the form of clusters as in Italy and strong linkages between the academia and the enterprises in Germany.

The experience of Indian clusters shows that knowledge and information sharing are mostly informal (and that too within narrow caste groups). Formal component which caters to strong linkages of academics with industries is missing, which on the contrary is a strong feature of German and Italian models of innovation. As a result, in the Indian case, information acquisition regarding the latest developments in a particular field is wanting. Work sharing is not seen in the clusters, as it is a fight for the same customer and in the same market. And as most of the clusters are created for production related issues such as, procurement of raw material, maintenance and corrective actions, the marketing

related issues are seldom dealt with. The marketing related issues are the real differentiators between a multinational company and the SMEs entrepreneurs. With the creation of clusters, the SME entrepreneur can compete with the multinational companies on the issues of quality and other production aspects. But when it comes to capturing the market, the multinational companies (MNCs) are far ahead of the small-scale entrepreneurs. With the marketing muscle the multinational companies take away the market share from the small-scale entrepreneurs. Thus, these clusters do not really serve the wider purpose as they do in Italy and Germany, i.e. Indian clusters are not united to meet common marketing challenges (except in Gems and Jewelry). This is one of the reasons of success in the case of Italian model where every thing from raw material to marketing is taken care of by the consortia. It is very well observed in case of Italy. The creation and use of specific data bases from production to marketing (as in case of Italy} lacks in the Indian situation.

Conclusions

The models of clusters whether in Gujarat (India), Italy or Germany, have a number of similarities as well as distinguishing features. By definition enterprise units in a cluster are located in geographical proximity performing different functions. This feature is characteristic of all the three models. Units are connected/dependent on each other through several areas of activities such as: a) manufacturing/production requirements for example supply chain (component makers and assemblers), common testing facilities etc. b) collective buying and selling e.g. raw material procurement, common marketing etc. c) knowledge generation, sourcing (from outside the cluster), and sharing take place within the cluster. It is observed that the 'industrial cluster' has in addition to enterprise units, units that perform the role of establishing linkages including those related to knowledge. For example in Germany, Aachen Technical University is a unit within the cluster for knowledge generation and sharing; and in Gujarat, the Rajkot Engineering Association in case of Diesel Engine Cluster or the CGCRI unit in case of Ceramic Industrial Cluster also perform this function of knowledge sourcing and sharing. In the Italian case, the Consortia and the Science and Technology Parks perform this role. It is concluded out that for a cluster to be

successful, out of all the activities as mentioned above, knowledge sharing through linkages and networking is central to technological change and innovation and to be competitive in the market. The prime difference between these models has been that in the Indian case the informal knowledge / skills sharing and flow is very strong, which is transmitted through generations down the line by learning by doing. However, networking for formal and constant sharing of new knowledge and skills is very poor and cannot bring in required innovations, hence cannot survive competition for a long time. In contrast this component of new knowledge sharing and transfer is very strong in case of German and Italian models through linkages and networking and hence the success.

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