Chapter 8
Export Clusters

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Industrial clusters, specially export-oriented clusters are rather new and emerging strategies for companies and countries to achieve export development throughout the world. According to Porter (1998) in his well known paper, clusters and the new economics of competition, "paradoxically, the enduring competitive advantages in a global economy lie increasingly in local things – knowledge, relationships, and motivation that distant rivals cannot match". These clusters have been considered as competitive advantage of nations.

The experience of several developed economies including United States (in, for instance, Silicon Valley, California; Research Triangle, North Carolina; etc.) and other regions of the world (e.g. Ireland, Scotland, Singapore, New Zealand, and Australia) has demonstrated that strong clusters ensure sustainable competitive advantage within a region. Examples for developing countries are clusters in India, Pakistan, Turkey, Chile, and Brazil to name a few.

In this chapter, we will discuss different aspects of clusters and export oriented clusters, and attempt to highlight key issues in developing successful clusters.

8.1 Cluster Definition

There is no precise definition for clusters and almost all of the existing definitions are based on the description of clusters. The following definitions are the most acceptable ones among the researchers and practitioners. According to Porter (1998), "a cluster is a geographically proximate group of interconnected companies and associated institutions in a particular field linked by commonalities and complementarities. Clusters encompass an array of linked industries and other entities important to competition... including governmental organizations and other institutions – such as universities, standard setting agencies, think tanks, vocational training providers and trade associations." UNIDO[1] also defines clusters as

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[1] United Nations Industrial Development Organization.

sectoral and geographical concentrations of enterprises that produce and sell a range of related or complementary products and thus, face common challenges and opportunities (UNIDO 2001). Another definition points out that an industry cluster is "a group of business enterprises and non-business organizations for whom membership within the group is an important element of each member firm's individual competitiveness. Binding the cluster together are buyer–supplier relationships, or common technologies, common buyers or distribution channels, or common labor pools" (Bergman and Feser 1999).

Rosenfeld (1997) indicates that an industry cluster is "a geographically bounded concentration of similar, related or complementary businesses, with active channels for business transactions, communications and dialog that share specialized infrastructure, labor markets and services, and that are faced with common opportunities and threats." Most of the above definitions focus on the geographic scope of clusters. Based on this feature, clusters can be divided into two categories of "deep" and "shallow" clusters. A cluster's depth refers to the number of firms in a specific geographic area. Where there is a large concentration of firms in a particular area, the cluster is said to be "deep" and, conversely, where there is a low concentration of firms, the cluster is said to be "shallow".

And finally, clusters are inter-related industries and institutions that mutually reinforce and enhance competitive advantage by acting as each other's consumers, competitors, partners, suppliers and sources of research and development, relying on collaboration and cooperation between public and private sectors, breaking down barriers and promoting the intangible assets of synergy, trust and social capital. Clusters give an industry a stronger collective voice on R&D funding, skill development, legislation and regulations.

Cluster-based economical policies are nowadays considered as an essential component of SME[2]s development in many countries. Many of the constraints facing SMEs are related to SMEs isolation rather than their limited size. Clustering and closer cooperation among SMEs can, therefore, be a solution. SMEs in a cluster could benefit from the cluster's advertisement impact and the possibility of meeting the requirements of large-scale orders through networking. Moreover, cluster members benefit from collective actions such as joint marketing, purchasing, and technology management, training, facilities, testing, etc. which are all factors that lead to achieving economies of scale. Therefore, the key feature of this type of SME grouping is cluster dynamics which lead to SMEs growth. As companies spin-off and compete with each other to expand their production capabilities, technological variation occurs within the cluster. More specialization increases/intensifies the need for cooperation and horizontal integration between partners offers new business opportunities within the cluster. More integration leads to the overall specialization of the cluster and increases its dynamics and competitiveness.

Before further detail, it is necessary to distinguish between clusters and networks. Networks are groups of firms that cooperate on a joint development project, complementing each other and specializing in order to overcome common problems, and

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[2] Small and Medium Sized Enterprises.

achieve collective efficiency and penetrate markets beyond their individual reach. But as networking intensifies and more and more enterprises get involved, the territorial, or *cluster*, dimension starts to emerge with the involvement of business development service providers, associations of enterprises and government institutions. Therefore, a larger number of different institutions are required to be involved to construct a cluster.

8.2 Export Oriented Clusters

In Sect. 8.1, we completely discussed the definition of clusters; however, our focus in this chapter is on clusters with export orientation, or clustering as a strategy for development of export. Here, the main questions are "Do cluster based firms perform better internationally?" and "Is export development a common priority for cluster initiatives?"

According to a recent study (Solvell et al. 2003), 84% of the studied cluster initiatives had a strong component of export promotion as part of their commercial objectives. The opportunities clusters offer firms to significantly increase the quantity and quality of export has been well established through experiences, such as in Tirupur textile cluster in India. The textile entrepreneurs in Tirupur believe that the formation of the Tirupur Exporters' Association (TEA) in 1990 and the activities pursued within the cluster strategy played a major role in upgrading the clusters' capabilities and, ultimately, lead to a tenfold increase of exports in 10 years.

Particularly, in smaller and developing countries, export promotion tends to be a primary focus of cluster initiatives. Establishing a successful presence in foreign markets is considerably more difficult for an SME than for a large enterprise, particularly in developing countries. Minimum volume requirements, quality controls, complex export processes, and limited financial resources are the main barriers for a less experienced and smaller enterprise.

Here again there are success stories. Costa Rica's Electronics and Information Technology cluster, a partnership between the government and the private sector, resulted in advanced manufacturing operations leading to the export of $44M (USD) of medical equipment and $36M (USD) of communication equipment (Singh 2003).

It can be inferred from the successful export clusters in the world that there are two approaches for developing export clusters, which can be referred to as backward and forward development of clusters, similar to the well-known backward and forward integration strategy of firms. The basic definition of cluster dictates the geographic proximity of the cluster's entities; however, as global supply chains increasingly become more integrated, there are more and more examples where this integration has led to additional investments and activities that ultimately strengthened the exporting cluster. For example, in Caldas, Colombia, Nespresso has established relationships with local cooperatives to produce "specialty coffee" as

a buyer. This initiative includes joint activities in areas such as specialized technical education, tasting, quality control, infrastructure upgrading, logistics, and traceability. This has contributed to the Colombia's ability to compete successfully in the "specialty and gourmet" coffee segment, where increased and consistent quality strongly influence the market price of the product. This type of cluster development can be called backward development in which the international buyers cooperate with local (usually small) producer due to some regional advantages of producers. In the other type of cluster development, forward approach, which is a common industrial cluster initiative; firms cooperate with each other to take advantage from collective actions. A successful example is the evolution of the Tirupur knitted garment cluster. The creation of the Tirupur Exporters' Association (TEA) in 1990 was the first real step in creating the cluster. By the end of 2004, the value of exports had risen from the level of $100 million in 1990 to $1.2 billion. Growth in garment making also triggered a parallel expansion within supply and service industries (e.g. yarn spinning, bleaching, dyeing, compacting, mercerizing and printing). Local spinning and dyeing capacity increased by 5 and 20 times, respectively, as garment-makers invested in their own facilities and specialized facilities were set up.

Finally, to conclude, we can consider the advantages of clustering as follows:

– Collective efficiency (creating synergy),
– Opportunities to *access market information* more expeditiously,
– Ability to obtain specialized inputs and technical support more easily and cost-effectively,
– Ability to participate in '*consortiums*' to fulfill large orders,
– Ability to leverage market development and promotional expenses,
– *Group shipments* to minimize transportation costs.

In the next sections, we will discuss some important issues and insights regarding the successful development of clusters and export promotion strategies. These issues are as follows:

– The "Four Gears" model of a National Export Strategy
– Cluster life cycle
– Different structures for different clusters
– Infrastructure development, financing and public–private-partnership (government regulations)
– Cluster success factors and assessment measures

8.3 The Four Gears Model of a National Export Strategy

In 2003, the International Trade Centre (ITC) introduced an "Export Strategy Template"[3] process guideline to help export strategy makers with their efforts to build a comprehensive and effective export strategy.

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[3] For details of this guideline see http://www.intracen.org/wedf/ef2006/Strategy-Tools.htm

This model consists of four key focus areas on which export strategy makers must focus to evaluate their current competitive position and to establish an export strategy agenda. The model has been illustrated in the Fig. 8.1. As shown in the figure, each gear drives the other gears. This characteristic shows the effect of different areas on each other and the importance of driving all gears in the same direction. This means that the success of an area can lead to the success of the other areas and vise versa.

It has been discussed in ITC 2005 that effective cluster initiatives must address all of the competitiveness and developmental "gears" of a national export strategy.

Three of the gears deal directly with cluster competitiveness. The fourth gear, the development gear, is concerned with the contribution the cluster makes to socio-economic growth in the cluster's geographic area. In each of these gears, strategy makers have to consider the following issues:

– *Border-in issues.* Services in this area include enhancing existing supply capacities, capacity diversification, and inter-firm collaboration and networking, technology transfer and information exchange, collaborative production arrangements and competency development in export management.
– *Border issues.* Address bottlenecks in trade-related infrastructure, administrative procedures and documentation such as transportation, trade facilitation, company registration, cost and availability of pre-shipment and post-shipment finance and guarantees as well as non-tradable costs such as the cost of acquiring ISO certification.
– *Border-out issues.* Support exporters in dealing with opportunity identification, markets development and national promotion issues.
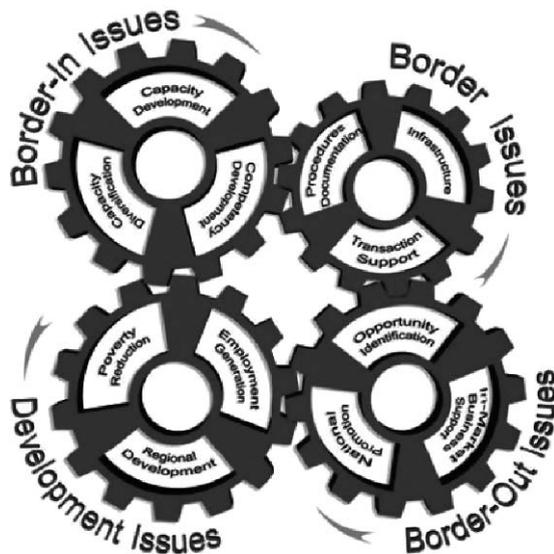

Fig. 8.1 The four gears model of national export strategy (ITC 2005)

– *Development issues.* Export strategies must also address the outcomes in terms of employment generation, poverty reduction and regional development.

Here, one may wonder what the differences, or similarities, between export consortia, as a strategic approach among firms, and export oriented clusters are. According to UNIDO guide on export consortia (UNIDO 2003), "An export consortium is a voluntary alliance of firms with the objective of promoting the goods and services of its members abroad and facilitating the export of these products through joint actions." Bangalore Machine tool cluster can be considered as a successful consortium (ITC 2005): where 56 SMEs were organized into nine marketing consortiums. So far one of its main achievements, in terms of export-related activities, has been the entry of one consortium into the Chinese market, which would have been impossible for any single firm to achieve. In general, the achievements of consortiums include:

– Alignment of efforts among firms and between firms and providers of business development services
– Elaboration of common brochures
– Establishment of joint marketing offices across the country
– Appointment of common sales agents
– Creation of common websites
– Joint advertising campaigns
– Common warehouses
– Collective participation in more international exhibitions

A key finding related to the role of export consortia and clustering in Brazil (Netto 2005) is that export consortia can be established inside a clustering system. However, it is still difficult to measure the impact of a cluster on the internationalization process of an export consortia or vice-versa. Indeed, analyzing the evolution of the collective approach strategies for SMEs, makes it clear that the export consortium is one step behind from the clustering system.

The clustering strategy offers unique aspects which strengthen the sustainability of this model. These aspects include the presence of high levels of cooperation and integration, collective learning and the presence of different actors. The export consortia can be a helpful tool which can leverage and accelerate the cluster's internationalization process, but clustering allows exploring and acting over the three dimensions of competitiveness: the structural (macroeconomic), the systemic (territory) and the enterprise level (inside firms).

8.4 Cluster Life Cycle

Clusters, just like any other live/dynamic system, have life cycles, but a main difference is that clusters are never created from scratch. According to Porter (1998), "Cluster development can be enhanced by conscious private and public action". However, there have been numerous cases following an "unrealistic

dream" approach to cluster identification, as was the case for several countries that embarked on extravagant projects centered on information and communication technology clusters. These initiatives were based on hopes rather than on a thorough analysis of potential and local conditions. ITC 2005 indicates a number of conditions which is required for potential clusters to be successful, such as confirmed production capacity within the target geographic area based on SMEs (and possibly one or more larger, prospective lead producers), some form of actual or potential competitive advantage (defined in terms of process, product, location or cost), latent readiness among producers to cooperate, and more importantly international demand for the product.

Clusters are dynamic and have a recognizable life cycle. The interventions that are appropriate at an early stage in the lifecycle of a cluster are likely to differ from those appropriate at later stages. The lifecycle is often described in different ways. Here, we describe the DTI model (DTI 2003) of cluster life cycle which can be represented simply as a cyclical process composed of four stages as Fig. 8.2:

As we can see the life cycle has been separated to four stages as follows:

– *Embryonic clusters.* Those at the early stages of growth.
– *Established clusters.* Those perceived as having room for further growth.
– *Mature clusters.* Those that are stable or will find further growth difficult.
– *Declining clusters.* Those which have reached their peak and are failing or declining clusters at this stage are sometimes able to reinvent themselves and enter the cycle again.

An important note here is how the public sector or leader(s) of clusters intervene in different stages of cluster life cycle. In embryonic clusters, government and intermediary brokers can be important in encouraging collaboration and acting as
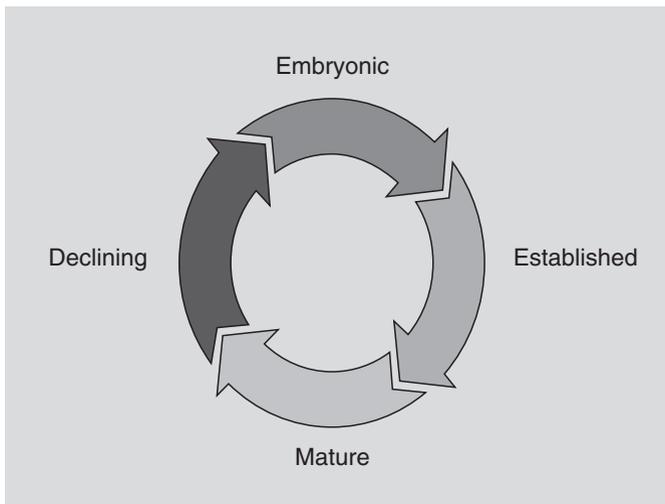

Fig. 8.2 The stages of the cluster lifecycle (DTI 2003)

information brokers, a role that may not be needed at a later stage. In embryonic clusters, for example, the prerequisite local conditions exist, but further development of the cluster requires a catalyst – the opening of an industrial park, or the building of specifically needed infrastructure – or a combination of catalytic inputs (including, for example, the emergence of entrepreneurial leadership such as Tirupur Exporter Association).

In the maturity stage, risks of stagnation and lack of competitiveness may lead the cluster to enter its decline phase. In this stage, firms and strategy makers should transform the cluster to earlier stages, such as embryonic or established phases. This can be best achieved through *product diversification*, *market repositioning* and/or *technology acquisition*.

8.5 Structure of Clusters

The main question in this section may be: "what is the right organization mechanism to support cluster development?" The organizational structure of a cluster can vary based on two factors: firstly, the degree of cluster specialization and cluster depth, and, secondly, the life cycle stage of the cluster. Even though these two factors are relevant, organizational structure of cluster changes between informal and formal structures. Awareness of strategy and policy makers of these conditions is very critical to sustain a successful cluster over time. In general, it appears that as clusters upgrade their capabilities and become more sophisticated, they tend to add formal organizational structures. This is certainly the case when a cluster becomes involved in infrastructure development or other initiatives involving a significant financial component. Nevertheless, it is important to know that there is no "best practice". According to (ITC 2005), although TEA, as a formal structure, was clearly instrumental in the success of the knitwear cluster, two other equally successful Indian examples – the hosiery cluster in Ludhiana and the ICT cluster in Bangalore – do not have a cluster "organization" per se. Clusters in northern Italy have been traditionally based on interpersonal relationships and old commercial relationships that built "social capital" in the form of strong "trust" between players. Existence of trust in clusters with informal structures is an essentially important factor. Schmitz (1999) has extensively emphasized the role of trust in export clusters in Brazilian shoes export clusters and Pakistan surgical instrument export. In *leather* shoes, the Sinos Valley in Southern Brazil accounted for about 10% of world exports in 1990; having started from near zero in 1970, and the cluster of Sialkot is estimated to account for over 20% of world exports in surgical instruments, making Pakistan the second largest exporter after Germany. According to his paper, "The Valley was rich in social capital but poor in financial capital. The latter was to some extent overcome by pooling financial resources." Finally, Schmitz (1999) concludes that, there are two distinguished types of trust (Fig. 8.3): one is based on family, ethnic or other attributes (which are called "ascribed"), and the other is based on not old socio-cultural ties but on conscious investment in inter-firm relationships (earned trust).

"Shallow" and embryonic
clusters

"Deep" and mature
clusters

Regulations

Informal structure
(Social capital)

Formal structure

Ascribed trust

•*Large firms*

•*High technical know-how*

•*Small firms*

•*low technology*

•*Rapidly changing technology*

•*Large foreign buyers*

Fig. 8.3 Transforming structures of clusters (Schmitz 1999)

The former usually exists in earlier stages of clusters and gradually transforms to the latter. Also, there are three categories of trust in the Pakistani cluster called: caste or "biradari", family ties, and social networks based on being "local".

8.6 The Role of Public Sector and Financing in Clusters

To develop a successful cluster, the existence of a catalyst, a coordinator and a leader is almost essential. However, in developing or developed countries this catalyst can be a public or private entity or a mixture of both. Furthermore, there is also a growing consensus about the importance of the role played by other key cluster actors, such as educational and research institutions, financial institutions, suppliers, and integration with the global operations and firms relevant to the sector.

In this section, we will discuss the impact of government on clusters, and financing support institutes in different types of clusters.

Before providing further details, it is necessary to distinguish conditions in developing economies and developed ones. According to studies examining clusters in different places of the world, there are important differences in the dominant basis of cluster competitiveness in developing nations. In general, SMEs in transitional economies can operate under severe financial constraints and heavy distortions. Many other conditions are also generally weaker in developing countries. Deficient physical infrastructure, rigid labor laws, and weaker justice systems generally hinder the development of a strong and internationally competitive cluster. Many transition economies also have a legacy of public ownership and public dominance over resource allocation and central planning.

Singh (2003) has investigated the government's role as a cluster catalyst and indicated the key government functions, actions and impact on selected clusters along with areas for governments to support clusters with several examples of government's intervention in different parts of the world.

In addition to the three basic roles of government in providing suitable macro economic conditions, improving microeconomic capacity and, establishing a supportive and progressive regulatory environment, Porter (1998) argues that the government's role should also include facilitating and upgrading cluster development and creating opportunities for productive dialogue to bring cluster participants together. Some key government functions, as Singh (2003) indicated, are as follows:

– Play the role of a "broker", "facilitator", "initiator", "participant" and "listener" to engage partners in a productive dialogue and create a sense of urgency to cause action.
– Conduct ongoing cluster assessments to determine its viability and relative strength to ensure global competitiveness.
– Institutionalize cluster upgrading (e.g. restructuring government programs and services, diffusing new knowledge, and collecting and disseminating data/information by clusters).
– Directly invest in and provide investment incentives for technical, physical and knowledge infrastructure.
– Sponsor cluster conferences and forums to promote "social capital" (Porter 2000) opportunities for participants.

Some successful interventions of government in clusters are as follows in (Singh 2003):

8.6.1 Ottawa's Silicon Valley North

The early success at the Silicon Valley North's telecommunication cluster can be attributed to the Government of Canada's unprecedented R&D spending levels, tax credits and start-up support for companies. If Ottawa had not been blessed with government laboratories, such as the NRC and the Defense Research Board, at the end of WW2, firms like Computing Devices of Canada and Leigh Instruments would not have been created.

8.6.2 India's Bangalore Software Cluster

This is an example of a deliberate public policy to support moving from application software to systems design cluster. In 1991, the government initiated 15 Software Technology Parks instrumental in creating a critical mass of 180 companies with 20,000 skilled professional workers. It exported 85% of its software products as merchant exports accounting for 350 M$ (USD) in 96/97, growing with a 64% rate

in 2002. While Information Technology Cluster growth worldwide has waned, the Bangalore Cluster continues to grow. Bangalore attracts talented ex-patriots, foreign investment and major corporations. Oracle, Microsoft and GE have opened offices in Bangalore.

The US Department of Commerce, Economic Development Administration, sponsored a major project to identify America's industry clusters. The project identified 380 leading clusters accounting for 78% of the nation's exports.

Finally, Singh (2003) suggests that government as a facilitator, not a master strategist, creates opportunities for cluster participants to organize, identify and solve common problems, then the private sector leadership will emerge to drive the process.

Singh (2006) addresses the key issue associated with the *financing* of cluster development. Financing of cluster development is one of the major issues and constraints that serve as a hindrance in developing countries to the successful performance and development of especially export-oriented clusters. It is important to note that several of the existing financing arrangements or options that are available in developed countries do not necessarily work for growth of clusters in developing countries. Some of these financing sources in developed countries are as follows:

– Venture capitals
– Angel investors[4]
– Insurance companies
– Public pension funds
– Foreign direct investment

But in many developing countries these sources are not available and, in stead, in several developing countries government agencies (and sometimes development agencies such as UNIDO, World Bank, etc.) seek to provide access to capital.

However, these options are few and far in between and also have led to several initiatives failing to sustain after their initial promotion. In that paper, the new emerging PPP[5] model, which has shown good results after being implemented in Indian clusters, has been presented. In this model, a consultancy institute as PPP manager has the responsibility to assist the Government and the Industry with the development and commissioning of the cluster parks on a *Concept to Commissioning* basis. To do so, it created an exclusive Business Unit, namely Cluster Development Initiative (CDI), and deployed a multi-disciplinary professional team, under the leadership of a carefully chosen CEO, to execute the program. In addition, various other technical services (e.g. architectural design and planning, financial analysis, technical selection of machinery, etc.) are outsourced when required.

In order to undertake these tasks, this professional intermediary organization should have the competencies related to capacity building, project development, financing, implementation and O&M of infrastructure projects on a PPP basis. The relationships between cluster stakeholders have been shown in Fig. 8.4. This project

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[4] Angel investors are risk financiers who typically provide the first level of outside investment to small start-ups to take them to the next level.

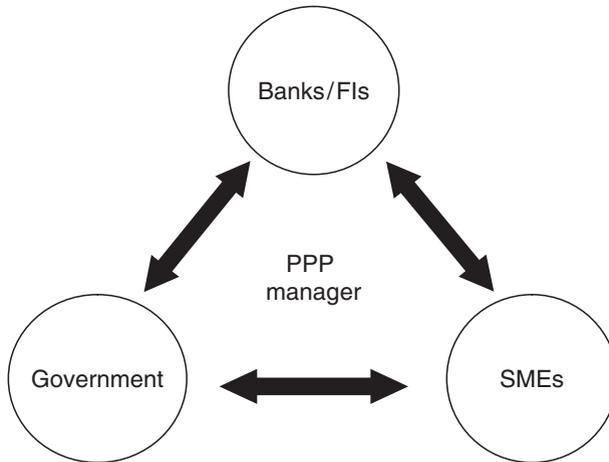[5] Private–public-partnership.

Fig. 8.4 The structure of PPP model (Singh 2006)

finance structure results in a win–win situation for all of the three major stakeholders of the process:

– The Government; since its financial support actually results in financial closure of the project and thereby achieving the purpose for which the assistance is provided.
– The financial institutions; in view of better off-take of loans at minimum transaction costs with appropriate security coverage ensuring better repayments.
– The SME enterprises; whose schemes become bankable and can access institutional finance, which otherwise would be difficult on an individual basis.

Finally, it is important to note that many cluster objectives – for example networking, lobbying, and commercial cooperation – do not require large budgets. There are, however, other objectives that have more significant funding requirements, including infrastructure improvement, cluster expansion and technical training. The results of a research conducted by UNIDO (Nadvi 1995) confirms that the absence of adequate infrastructure, which undoubtedly reflects the absence of financing for infrastructure, represents the single greatest constraint to the growth and competitiveness of most of the clusters assessed.

8.7 Cluster Success Factors

There are different descriptions of success factors for export cluster. In this section, we will present the results of two studies.

8.7.1 DTI Report

Department of trade and industry (DTI 2003) of England in a report as "a practical guide to Cluster Development", expresses these factors as follows:

The evidence suggests three critical success factors which form the basis of cluster success:

1. Networks and partnerships
2. Strong skills base
3. Innovation and R&D capacity

8.7.1.1 Networks and Partnerships

Some networks generate formal and informal flows of knowledge and information throughout a cluster. These networks are the basement for success over time. Collective learning and more competitive performance could be carried by the access to tacit knowledge. Many cluster evolution activities are delivered by the networks way.

Prosperous clusters are prone to have powerful embedded networks and relationship systems. Trust and inter-personal relationships are favorably progressed, supplying the cluster with a high rate of social capital. The improvement of these relationships and connections needs time. Networks may be supported through strong organizational structures, or through shared cultural values and a common purpose.

Face-to-face links or remote technologies such as the web could be the tools to sharing knowledge through networks and partnerships. Technology has advanced considerably in this field and cluster practitioners are using interactive cluster portals to aid networking, share information about the cluster as well as using them for actual business to business interactions. The key is that a flow of knowledge occurs in more complex networks in which active collaboration is encouraged.

8.7.1.2 The Presence of a Strong Skill Base

There is a consensus across the literature that successful clusters are those that have a great base of skills, in higher levels and in management skills, and also have an appropriate and qualified labour force in general. For drawing the companies toward a cluster and keep them with a cluster, and also to keep on with a prosperous development of companies in a cluster, this element (labour force) should be taken highly into consideration. So, considering all of these factors and as a reasonable comment we could say that the quantity and quality of the labour force is a highly vital element in the development of successful clusters.

A range of adequate skills and abilities are required for successful clusters. The kinds of business skills that are pursued in successful clusters are those associated

with global businesses such as strategic management skills for business leaders, entrepreneurship for graduates, management and production techniques, leadership skills, mentoring/coaching and personal development skills, etc.

The quality and availability of training can also be a factor contributing to the progress of successful clusters. This can apply to the existing workforce as well as to the new and potential entrants to the labor market. The capacity of the available training infrastructure to respond to employer needs and provide relevant training is a key factor. The cluster can have an influence on the provider side in terms of encouraging appropriate provision that is flexible and meets the needs of employers.

8.7.1.3 Innovation and R&D Capacity

The evidence shows that product evolvement and well-developed research structures, with other forms of innovation, are essential for a dynamic cluster. Innovation keeps the cluster at the head of the market whilst a strong R&D base would be able to give the ideas and products for future development. The advancement of innovation and R&D are two separate but inter-related activities. Innovation in general applies to product or process development, but what is meant by R&D is the development of new knowledge. In the best cases successful innovation is the outcome of the R&D process. Innovation can be incremental so that existing products and processes are built upon little by little, or may be more radical by introducing a completely new product or approach. Successful clusters are inherently innovative and practitioners can support the innovation process through encouraging networking and the sharing of ideas. The development of networks outside the cluster could also be beneficial as often innovative ideas are the ones that work well in one setting and are being applied for the first time to another area. The benefits of information and intelligence services in this area are often worth exploring.

Constitutions based on research activities, as for universities, non-profit foundations and for-profit R&D could function greatly as catalysts for research and innovation. They are able to provide the foundation for developing new ideas and applications, besides that, they could also play an essential and critical role in nurturing high technology entrepreneurialism. Looking from this point of view it could be said that, public and private research tools and resources are the key drivers for the cluster.

8.7.2 The Cluster Initiative

A survey (Solvell et al. 2003) of over 200 cluster initiatives (most of them in developed countries), pointed out three common elements that, have some kind of effect on raising the desire of new corporations and companies to join the cluster and/or increasing the cluster's international competitiveness:

- *Having the right resources.* A budget that provides a cluster initiative with enough fund so that it would be able accomplish important projects without the need of additional funds is highly connected to the attraction of new firms.
- *Having a strong and respected facilitator.* He or she is ought to have a great knowledge of clustering, a powerful network of contacts and enjoy the respect of cluster members.
- *Building a common framework.* A framework based on strengths, where efforts and time are dedicated to sharing the framework among cluster members, developing an explicit vision collectively and specifying quantitative targets.

There are some other factors that are often mentioned and talked about. These other factors include, a reliable and proper infrastructure, having some sort of entrepreneurial and risk taking characteristic and venture capital, as well as having a high potential of making and designing complete backward and forward linkages. But also in sectors like ICT, another favorably relevant factor is the educational and professional institutions taking part. A stable business environment, suitable policy intervention, and large firms acting as catalysts are also some factors that have introduced themselves as significant and extremely relevant factors, in certain contexts, particularly in developing countries.

According to Rosenberg (2002), many success factors in the original California's Silicon Valley have been identified by researchers over the years some of which are presented here: low taxes, venture capital, risk taking start-up culture, business webs, physical infrastructure, IT-savvy local population, local "living laboratories," good local markets, networking skills, activities and organizations for communities of interest, collocation of companies in various stages of development, flexible organizational structure, legal/accounting services, M&A activity for flow of skilled labour and intellectual property, local academic and research institutes, commercial partnerships between academia and industry, activist government policy via research funding and small business debt assistance, speed of business activity, presence of role models, and human talent in innovators, serial entrepreneurs, marketers, and managers.

Above all, success is in fact the mixture, combination, arrangement and order in which the ingredients come into play, and how the factors settle beside each other, the environment – both local and global, the opportunities and the timing. (Singh 2005)

8.8 Measuring Cluster Development

This section is based on DTI (2003).

Having favorable and measurable feedback is an essential part of the strategy review process, and also is a considerable help to the development quality of the strategy itself. However, from the work undertaken, and reported in the accompanying evidence paper, there is little evidence of the use of consistent indicators by which to measure the development of clusters. In this part, an approach to indicator

selection is proposed. At first, indicators are assumed and used as a decision support tool and further in the approach a potential monitoring framework is considered.

Different cluster initiatives have developed their own measures of success. They depend on the objectives that the initiative had set for itself.

It is clear that establishing a set of metrics that are capable of tracking the performance of a cluster over time and space is important for:

– Assessing the impact of cluster measures
– Benchmarking performance

Understanding the different elements of clusters and their respective performance is an important step in identifying where clusters might be strong or weak and where subsequent intervention might be appropriate. This involves quantitative and qualitative analysis. Quantitative analysis might include statistical or numerical analysis on variables such as employment or output. Qualitative analysis might include discussion with businesses in the cluster on the innovative content of projects, or an assessment of the "softer" dimensions of the cluster.

Some of the principal factors promoting clusters as identified in studies focusing on ICTs include:

– The presence of educational institutions which produce a stream of engineers
– Technicians and scientists
– State support in the form of tax incentives and subsidies
– Salubrious living conditions which enhance the quality of life, especially in university towns
– Availability of venture capital
– And generation of forward and backward linkages

8.8.1 Measuring the Success of Interventions

Policy makers are willing to know if their intended goals have been achieved by the interventions adopted for the enhancement of the cluster performance. Also, they want to know why interventions have not leaded to success. This information will help to identify the effectiveness and efficiency of a certain policy approach and whether it is appropriate or not. Measuring success can be performed in an actual sense, i.e. has the intervention achieved the aims it has set itself, but might also be considered relative to other possible actions, or similar approaches adopted in other locations. Regular monitoring will also help to ensure that the intervention is being implemented as planned and is having the intended effects, acting as an early warning of any potential difficulties.

Measuring the success of diverse interventions contributes to the monitoring and evaluation of cluster development policies as a whole. It is important to understand whether success or failure is due to the interventions adopted or to outside factors beyond the control of policy makers.

Cluster measurement may seek to identify three key things:

– *The appropriateness of interventions.* To estimate the relevance of the policy or intervention with regard to the technical, social or economic problems it is meant to solve.
– *The effectiveness of interventions.* The fact that expected effects and objectives has been acquired. Calculated by relating an output, result or impact indicator to a quantified objective.
– *The efficiency of interventions.* The fact that the effects were obtained at conservative cost and were worthwhile. To calculate this factor an efficiency indicator is usually obtained by dividing the budgetary inputs by the quantity of effects obtained.

Ideally, a measurement procedure should capture both the effects of the interventions being undertaken and the development of the cluster in general. For the development part it should take into consideration the several aspects of cluster development and try to understand how each element is progressing over time. Clusters are multi-faceted and measurement should recognize this. There is little point in measuring one or two dimensions of a cluster, as this will lose important aspects of performance. In practice, those aspects that are cited as the most important in cluster development, such as networks and the development of social capital, are currently not being measured on a regular or consistent basis. Most measures have the economic performance of the cluster as the main measurement. This captures the outcomes but cannot provide information on what is happening to the drivers of cluster success. The different dimensions of clusters can be broadly classified under one of four headings which broadly encapsulate the following three "drivers":

– Networks and partnerships – the extent of social capital.
– Innovation and R&D – the extent of innovation and R&D capacity.
– Skills – the availability and quality of the workforce within the cluster.
– Economy and enterprise – the level of employment, number of firms and their performance and the outcomes.

As a principle the success of a certain intervention should be assessed on the basis of what it is planned to achieve, and the assessment of how this helps the overall performance of the cluster itself. Measuring the performance of clusters is based upon improvements in the performance of the constituent parts of the cluster, and establishing the effect of cluster policies upon this. It is common practice to seek to:

– Identify the outcomes of any intervention
– The results achieved by this; and potentially
– The impact that this has had on the development of the cluster as a whole

For the purpose of deciding which indicators to use, not only should we take into consideration their relevance to the action in hand, but should also consider whether they have a wider relevance or not. Indicators that are confined to a certain context or cluster would not always be useful for measuring the relative efficiency, in respect to comparable clusters in other places in UK or foreign countries. Definite increase

Deriver-Network and partnerships	Deriver-Innovation and R&D	Deriver-Human resources
• Number of partnership arrangements • Number of co-operation agreement • Number of networking events • Number of joint research activities • Extent of social	• R&D employment • R&D expenditure • Number of business spin-outs • Number of patents applied for • Number of innovation awards • Number of new products /processes adopted	• Number of vacancies • Educational attainment rates • Number of defined qualifications • Event of measured skills gaps

Outcome: Economy and Enterprise	
• Net employment change • Increase in GVA/GDP • Growth of exiting businesses • Number of firm within the cluster	• Level of investment • Level of profitability • Value of export

Fig. 8.5 An illustrative monitoring framework (DTI 2003)

in research funds which are received by an individual university are samples of unique indicators. A preferable measurement could be an overall measurement of the research cost in the cluster as a whole.

The science of measurement of clusters will hold on to its infancy. So measuring the efficiency of a certain cluster in a definite way would be out of reach. However, it is possible to aim for an understanding of the results of particular interventions on the identified cluster and its component firms.

The choice of what indicators to use is dependent on:

– The nature of the cluster
– The nature of the interventions adopted
– The overall policy objective

We have formerly suggested that for measuring the enhancement and growth of clusters we should differentiate the diverse dimensions of clusters. The selection of indicators should illustrate this approach. Some indicators with the probability of success are depicted in Fig. 8.5 below. These are not definitive and exhaustive, but give a picture of the potential indicators that could calculate the development of clusters.

8.8.2 Establishing Targets

Determining targets for certain indicators is an important aspect of cluster development initiatives. In addition to knowing the direction we wish to head, it is important

Table 8.1 Cluster policy vs. industrial policy (Ketels 2003)

Industrial Policy	_Cluster-based Policy_
• Target desirable industries / sectors • Focus on domestic companies • Intervene in competition (e.g., protection, industry promotion, subsidies) • Centralizes decisions at the national level	• **All** clusters can contribute to prosperity • Domestic and foreign companies both enhance productivity • Relax impediments and constraints to productivity • Emphasize cross-industry linkages / complementarities • Encourage initiative at the state and local level
Distort competition	_Enhance competition_

to know the distance and the time that it may take. Targets should be:

– _Specific_ to the initiative in hand
– _Measurable_ using identified data sets
– _Achievable_ by the initiative in question with the resources available
– _Realistic_, given the existing state of play
– _Time-bound_, in that there is an agreed data by which they will be achieved

8.9 Cluster Policy Vs. Industrial Policy

Following table (Table 8.1) innuendo cluster policy vs. industrial policy.

8.10 Cluster Initiatives Require a Catalyst

This section is based on ITC (2005).

A cluster can develop, grow and be competitive without its members ever embarking on aligned "joint" initiatives. Silicon Valley in California is an example of a very prosperous cluster that happened by the natural gathering of related businesses in a geographic area. But, for the majority of instances, and definitely in the vast majority of clusters in developing countries, a catalyst is needed. This catalyst is normally an institution (as evidenced by KNIDGRO's activities in Ludhiana). In Tirupur's case, TEA assumed the role of both cluster catalyst and cluster leader.

In fact, if in addition to growing, a cluster wants to evolve, coordination and management should complement the catalyst and leadership roles. Formal or informal associations may provide the necessary management input, through a formalized

approach, such as that followed, although flexibly, by TEA would seem to be the best option. And a solid public–private sector partnership is an essential precursor to coordination. Industry clusters now play a major role in public debate, economic policy and research.

Beyond research and debate, however, there has been growing recognition that the effective management of clusters can have an important impact on competitiveness and economic performance. A recent study pointed out 719 clusters in over 49 countries, from which 23 of them were developing nations. A 2003 survey of over 200 cluster initiatives revealed that over 80% of the respondents believed that the initiative had improved the cluster competitiveness, and over 60% were confident that the initiative had improved the cluster international competitiveness.

Because of this growing interest, at the request of the Executive Forum network, ITC is arranging a cycle of specific consultations over the first half of 2005. The several negotiations focus on the important issue relating to the theme of "Competitiveness through Public–Private-Partnership".

A report as consultation on "Competitiveness through Export Clustering: Strategic Considerations" was being arranged by the ITC Executive Forum Team, UNIDO and the Tirupur Export Association. The purpose of this consultation is to provide a forum and vehicle for public and private policy makers to review insights not only from research, but also from the growing experience base of countries around the world who have undertaken initiatives to enhance cluster performance (Table 8.2).

This section is an overview of various aspects which are related to cluster constitution and growth, drawing on the experience of a number of cluster initiatives and in fact is the first level to set off this consultation. This discussion paper also proposes general frameworks and language that is used to construct the ten specific questions given by the consultation:

 1. Why clusters?
 2. Can clusters boost the quality and quantity of exports?
 3. Why do clusters succeed? When do clusters fail?
 4. Do clusters just happen or can they be made?
 5. Does the public sector have a role in creating/building clusters? Or is this mainly a private sector initiative? Who else should be included?
 6. Does a developing country cluster differ from a developed country cluster?
 7. Do clusters require a formal structure? Or is an informal network enough? What is the role of trust?
 8. Should buyers be included in an "Export oriented Cluster"?
 9. What is the role of financing? Who pays for what?
10. Are benefits measurable? Are the theoretical benefits borne out in reality? Are the benefits equally distributed?

Measuring the answers of these questions requires the reference to this conclusion.

Table 8.2 Private sector and government potential contributions (ITC 2005)

Government potential contributions to cluster development	Private sector potential contributions to cluster development
Support cluster-specific information gathering and compilation	Jointly develop mechanisms to collect and disseminate cluster information
Organize its services around clusters	Develop specialized education
Foster linkages between universities and clusters	Collaborate with local universities and institutions on cluster-related research
Improve infrastructure requirements for clusters	Market jointly through trade fairs and delegations
Streamline regulations that affect clusters' ability to compete	Collaborate on international market research
Focus export promotion activities around clusters	Find a balance between cooperation in some activities and competition in others
Act as a sophisticated buyer for clusters' products and services	Establish cluster-based trade associations
Establish cluster-oriented free trade zones or industrial parks	Establish cluster linkages with suppliers, customers and related businesses
Focus efforts on attracting financing options around clusters	Cooperate with government to streamline regulations
Sponsor forums to bring together cluster participants	Take the lead on infrastructure projects, involving financial institutions and governments
Act as a catalyst for artisan clusters or clusters that need initial organizational support	Foster trust among its members
Incorporate interests of clusters in trade negotiations and international agreements	Start with small projects. Advertise early successes to gain support for cluster activities

8.11 Case Studies

We provide three case studies in this section. These case studies include some experiences in Turkey, Pakistan and finally, one of the most well known export clusters, Tirupur, India as successful clusters in developing countries and Boston export cluster as an example of successful ones in developed countries.

8.11.1 Turkey

This section is based on Yilmaz et al. (2005).

In Turkey, industries are dispersed all over the country; furthermore, another important point is that 99% of all enterprises are placed in SME category. Along the same lines, according to Yilmaz et al. (2005): "At present, there exist neither comprehensive strategies nor policies by public sector for clusters in Turkey", while many of enterprises belong to SMEs set. However, they had planned several programs for promotion of SMEs such as "SME strategy and action plan" in 2003.

According to this plan, they developed local and regional clusters which were formed within organized industrial zones, industrial zones and small-scale industrial states. Major traditional clusters that are scattered in Turkey can be listed below (Yilmaz 2005):

– Textile yarns and carpets: Gaziantep
– Ceramics: Kütahya, Bilecik and Eskisehir (They are in the same geographical Region)
– Automotive: Bursa, Kocaeli (They are at the same geographical Region)
– Machinery: Konya, Ankara (They are at the same geographical Region)
– Furniture: Kayseri, Inegöl (a town of Bursa), Ankara (Ankara and Kayseri are in the same geographical Region)
– Leather and leather products: Istanbul, Izmir and Çorlu (Çorlu (a town of Tekirdag) and Istanbul are close to each other geographically)
– Towels and bath robes: Denizli
– Clothing: Istanbul
– Gold jewellery: Istanbul
– Truck dressing: Beypazari (a town of Ankara)
– Rose oil: Isparta, Burdur, Denizli, Afyon.

The analysis of the existing conditions was required to be done with support of organization of small industrial estates (SIEs).

Today, different organizations are responsible for determination and implementation of SMEs policies. They have created a group as "SME Study Group". This group consists of Ministry of Industry and Trade, the State Planning Organization, undersecretaries of Treasury and Foreign Trade, State Institute of Statistics, Small and Medium Industry Development Organization, Union of Chambers of Commerce, Industry, Maritime Trade and Commodity Exchanges (TOBB), and Confederation of Tradesmen and Artisans of Turkey (TESK).

Some of organizations and companies that play important role are listed below:

● Private sector organizations. The associations/Unions cover many clusters. Export clusters owe these sectors for the economic growth in recent years. The private sector organizations consist of the umbrella organizations of producers, chambers of industry and commerce and their upper organization, "Union of Chambers of Commerce, Industry, Maritime Trade and Commodity Exchanges" (TOBB). They have been successfully active both in creating new clusters and developing clustering networks for the existing ones in their own areas.

   They export and do some activity to promote their members to invest, they also have close relationship to public organizations, private organizations and international organizations, etc.

● Public sector organizations: Turkey government established export associations as branches of undersecretaries for foreign trade, but government transfers their management to private sector. Therefore they have dual structure in term of management. They offer services like trade information, training, etc. furthermore, some of the mentioned associations are connected to many public and private organizations such as universities and manufacturers' associations/unions.

The other key public actors in the export clusters are as follows:

– Small and medium sized industrial development organization (KOSGEB)
– Technology development centers in universities and enterprise development centers

● Sectoral Foreign Trade Companies and Foreign Trade Capital Companies: Within the liberalization policy, large company model (Foreign Trade Capital Companies) was introduced to promote export products. As a result of increasing export, role of these companies become more highlight and they export some of SMEs' products. They lead clusters in many aspects such as cluster activities on export marketing and technology.
To develop foreign trade, another organization was established as Sectoral Foreign Trade Companies (SFTCs) in 1994. The main functions of SFTCs are export marketing and implementation of export procedure.
● NGOs initiatives: since 1999, a process has been started as "competitive advantage of Turkey" (CAT) in order to develop clusters. The project is directed by the Center for Middle East Competitive Strategy Center which Michael Porter chairs. The team work for CAT includes both foreigner and Turks and also private companies and commercial banks sponsor it.

8.11.2 Pakistan

This section is based on Fayyaz (2005).

In 2003, SME cluster development has been introduced as principal element of Pakistan trade policy and in order to adapt UNIDO's services, Export Promotion Bureau (EPB) determined phased approach (Fayyaz 2005). As a result of mentioned approach, five pilot clusters have been developed in different places in Pakistan as follows:

– Leather and leather products in Korangi, Karachi
– Gems and jewellery in Saddar, Karachi
– Ready-made garments in Lahore
– Electric fans in Gujrat
– Cutlery in Wazirabad

The government of Punjab as a Pakistan province governor, also, has started such cluster development approach based on UNIDO program for seven SME clusters in the province. In preliminary stage, in the 2004–2005 financial year, this project was supported with more than US$ 200,000.

We could list main related agencies to this project as follows:

– Federal and Provincial Agencies
– Ministry of Commerce (MOC)
– Export Promotion Bureau (EPB)
– Ministry of Industry & Production (MOI & P)

MOC and EPB have been selected as the mandate for development of export clusters. Small and Medium Enterprise Development Authority (SMEDA) is one of the major departments of MOI&P. They work on training, feasibility studies, business plans to add value to the export oriented clusters, at the same time, working on the supply side.

- Ministry of Commerce (MOC):

   Objectives that MOC should meet are announced as followings:

   – Developing and modernizing Pakistan trading system
   – Eliminating bottle-neck and developing liberalism in flow of trade
   – Creating opportunities for entrepreneurs

   In order to achieve these objectives, several departments at MOC are working together. Some of the major departments are as follows:

   – Export Promotion Bureau (EPB)
   – National Tariff Commission (NTC)
   – Foreign Trade Institute of Pakistan (FTIP)
   – Trade Marks Registry (TMR)
   – Trading Corporation of Pakistan (TCP)

- EPB as primary agency working under MOC is trying to promote export through the following initiatives:

   – Marketing (Market Research, Fairs and Exhibitions - local and international, Trade Delegations and . . .)
   – Communication (Publication of Trade inquiries/opportunities, Library, Export intelligence Bulletin and . . .)
   – Human Resource Development (Training Institutes, Seminars on ISO 9000 and 14000, TQM and . . .)
   – Service to exporters (Export Facilitation committee, Resolving problems in exports, Simplification of procedures, Export procedures handbook and . . .)
   – Regulatory (Formulation of proposals for the Trade Policy, Implementation of Trade Policy, Textile Quota Management, Registration of Importers/Exporters and . . .)
   – Special incentives (Scheme for freight subsidy on exports, Management Consultancy firms, Marketing & Brand development for Export Promotion and . . .)

- Ministry of Industries & Production (MOI&P):

   MOI&P prepares information and analytical insight to create a competitive price in a globalized economy. Some of the main activities of this ministry are as follow:

   – Marketing support to SMEs (for example to identify new opportunities, new markets, increasing their competitiveness, identify new opportunities in global markets, Branding Support.)

– Packaging Support (Factors affecting the type of packaging, Technical specifications required, Information sources on the packaging requirements of particular countries.)
– Advertisement & Media Support

As a result of review on Pakistan cluster program, we can find that government of Pakistan has played the major role in development of country export through export clusters. Moreover UNDIO in its published documents clearly considers the role of Pakistan's Government in the success of export clusters.

8.11.3 Tirupur

Indian industrial clusters have acted as nucleus that develops surrounding urban societies. One of these clusters is centered in Tirupur city in southern India and works on hosiery exports. In 1999, this cluster was accountable for more than 90% of Indian's knitwear exports to Western Europe, USA and Japan. This export was equal to annual production of 145,000 tonnes of fabrics, especially in the form of T-shirts and sweaters, which is equivalent to about 1,000 million USD and 10% annual growth is expected.

During the last decade, pressures of local and international standards in textile wet processing, forced dyestuff manufacturers and hosiery clusters to act under eco-textile standards, both in individual and industry group activities.

8.11.3.1 Context and Framework for Sustainable Development of a Hosiery Cluster

The main characteristic of India's industrial states is their clusters of small and medium size industries that drive local economic development process. Clusters in some zones are homogenous and in some others are heterogeneous. A map of some major industrial clusters is shown in Fig. 8.6.

Each cluster has created its own urban centers, which are penetrated in traditional rural areas. These rural ecosystems are expected to share their natural resources with industrial and urban areas, and accept industrial wastes. But, rapid growth of industrial and urban areas, is eradicating rural parts. Figure 8.7 shows a model that is depicting such phenomena. Tirupur is a classic example of this model and its statistic is summarized in Table 8.3. In general, ineffective resource conservation policies in industrial clusters, has inhabited faster technological adaptation to curb water and solid waste pollution.

Individual units within these clusters have been traditionally competing mainly on the grounds of cheap unskilled labor and low overheads due to minimal expenditure on technological safeguards for the environment; although in some cases the situation has been recently changing towards a better direction.
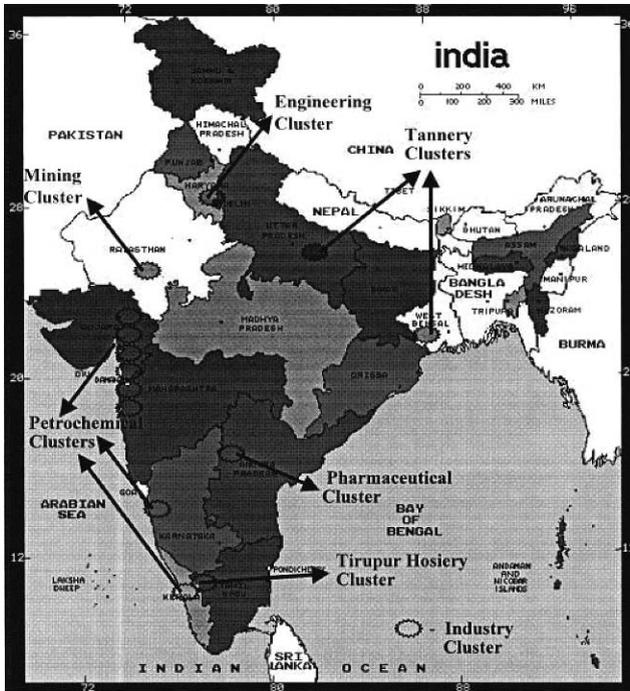
Fig. 8.6 Location of major industrial clusters in India (Narayanaswamy and Scott 2001)

Because of the rapid and unplanned migration of population from rural areas to urban areas and negligence in proper town planning, sanitation and other basic amenities are inadequate in these new urban areas. To move toward a sustainable developing state, Tirupur should develop a cohesive strategy in which both the hosiery cluster and rural areas should be taken into account. This strategy should be based on the availability of local knowledge and skills. In this strategy, clusters and urban areas should be thought as resource productive centers, especially with shared natural resources like water, land and energy. This ensures a sustainable resource from rural environment for a long time. Some pricing policies must be taken into account to persuade industries to use resources more productively. An appropriate GIS on clusters and rural–urban interdependencies would be helpful in zoning clusters to achieve sustainability.

The leaders of Tirupur Exporters Association (TEA) discovered the potential impact of globalization in the early 1990s, when the association was formed. As TEA's focus was on exports, its approach was global. India decided to welcome open market economic policies, but TEA decided as well beforehand. Like founding any other clusters, the first step in developing an export cluster is to evaluate any internal and external developments that is probable to influence the performance of the cluster.
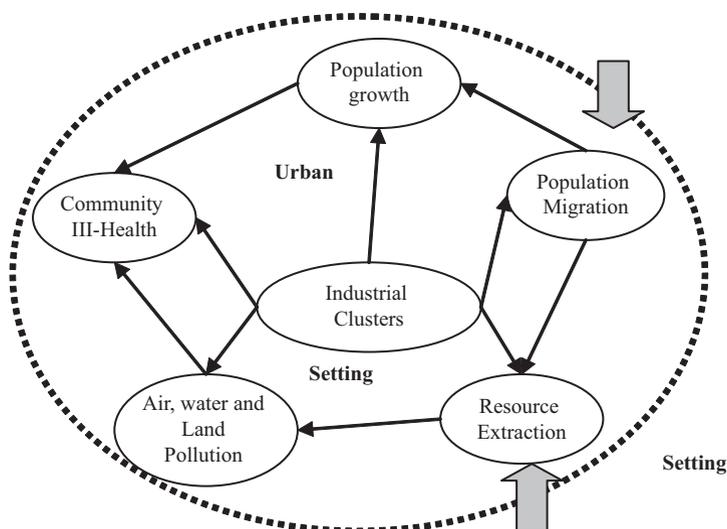
Fig. 8.7 Interdependency between industrial clusters and the rural environs (Narayanaswamy and Scott 2001)

Table 8.3 Major environmental indicators of the history cluster and urban Tirupur (Narayanaswamy and Scott 2001)

Housing	Around 150,000 houses, of which more than 70% lack a toilet facility and safe drinking water. 23% of the houses do not have electricity connections and 10% do not have all the three basic amenities
Water resource	The water table, on an average, is 65 m below the ground level, has a TDS of around 1,000 mg l^{-1}. 150 borewells are currently in operation. The river Bhavani, a monsoon driven, non-perennial river, located 55 km southwest of Tirupur is another major water source. Ten villages located at a distance of 2–37 km from the city provide water to industries. Private vendors abstract water from these villages and sell it to industry @ US$0.7 per m^3. These vendors cater to 90% of industrial needs and 10% of domestic water requirement
Energy consumption	The city consumes 115 M kWh pa of electricity, of which industry consumes 56%; commercial facilities 13%; public use 2% and residential 2%. Most firms and commercial units have diesel generators to help cope with erratic supply. Bleaching and dyeing units consume about 500,000 tonnes pa of fuel wood chopped from the nearby rain forest of the Nilgri hills in Western Ghats
Health effects	There are poor health facilities in the city, with only 1,000 beds (inclusive of government and private hospitals) for 400,000 people. Cardiac arrest causes 38%; respiratory failure 17%; and dysentery, diarrhea and fever 2% of total deaths annually

TEA members set TEA's objective during different brain storming sessions in 1990. These objectives were as follows:

- Multilateral growth of knitwear industry and exports
- Developing infrastructure needs of industry and community of Tirupur
- Promoting industrial harmony and peace by offering the workers fair wages and benefits, healthy working conditions and sharing of profits
- Fostering the growth of harmonious relationship with all sectors of the industry
- Forging meaningful relationship and constructive co-operation with other associations
- Sharing experiences and information with those who approach the association
- Help the foreign buyers:

  - In locating suitable suppliers
  - Resolving commercial disputes amicably through informal arbitration

In order to reach these objectives, TEA identified areas that needed attention both in short term and long term. Preliminary studies indicated the fact that there were serious deficiencies in the infrastructure and that some of these deficiencies were extremely critical not merely for growth but for the survival of the cluster itself. So, further attempts were made in several areas, such as:

- Infrastructure
- Production capacities and technology
- Marketing
- Manpower development
- Logistics
- Quality assurance
- Industrial peace
- Finance
- Fair business practices
- Community orientation of projects

Finally the gaps were identified and a holistic approach was developed:

- Industry required huge quantities of water. There was no perennial source of water supply anywhere in the vicinity of the cluster. Ground water available in and around the cluster was inadequate quantitatively and qualitatively. Unless water was made available for industrial use in adequate quantities and required qualities the survival of the industry, leave alone growth would be at peril. Besides industrial supply, the industry has a moral responsibility to improve supply of water for domestic use, as the entire population of Tirupur is dependent on knitwear industry and vice-versa, since public cannot bear the high cost of water proposed to be brought from a distance of 55 km. From a perennial source, the cost for domestic use may cross subsidized.
- Supply of huge quantities of water for domestic and industrial use must be matched by a scheme to evacuate the waste water. Hence an underground sewerage system may be put in place simultaneously.

– The roads were congested and badly maintained. Good roads for internal transportation of goods would be necessary.
– Production capacities need to be expanded, modernized and technologically upgraded.
– Marketing skills of exporters need to be honed up.
– The industry was already facing shortage of skilled manpower. Institutions need to be developed to train manpower tailored to the requirements of the industry.
– Problems of logistics should be addressed.
– Members should be motivated to introduce and practice quality, environment and management systems to enhance their credibility and competitive capacities in international markets.
– The burgeoning work force should be managed carefully to maintain industrial peace and harmony.
– Availability of finance for term loans for creating assets and working capital to run the operations should be ensured.
– Increase in the number of players would result in commercial disputes. A mechanism needs to be devised and put in place to settle commercial disputes amicably.
– Community development projects should be an integral part of industrial development.

TEA is trying to fulfill the specified objectives independently and jointly with other associations, and is currently executing some improvement projects (list of projects and its objectives have been introduced by Subramaniam 2005).

8.11.4 Greater Boston

This section is based on Swift (2002).

Nowadays, Greater Boston is known as economic engine of Massachusetts and also as one of the most developed and innovative regions in the world. This region includes all of Suffolk County, a large share of Middlesex and Norfolk counties, and portions of Plymouth and Essex Counties.

Based on the Bureau of economic analysis, the personal income of Suffolk, Norfolk and Middlesex Counties is more than 50% of the total state's income.

Six large export industry clusters are known as the component of export sectors. These clusters could be divided into two types: knowledge-based clusters and clusters that are less knowledge intensive. The first type of these clusters includes Information Technology, Health Care, Financial Services and Knowledge Creation. The other type, itself is divided into two main categories of clusters: "Travel and Tourism" and Traditional Manufacturing (such as paper, plastics and rubber and metal working companies).

Figures 8.8 and 8.9, show export clusters' growth in different themes, comparing the Greater Boston Region, West Sub-Region and Massachusetts. Gains and employment are two important factors in this comparison.
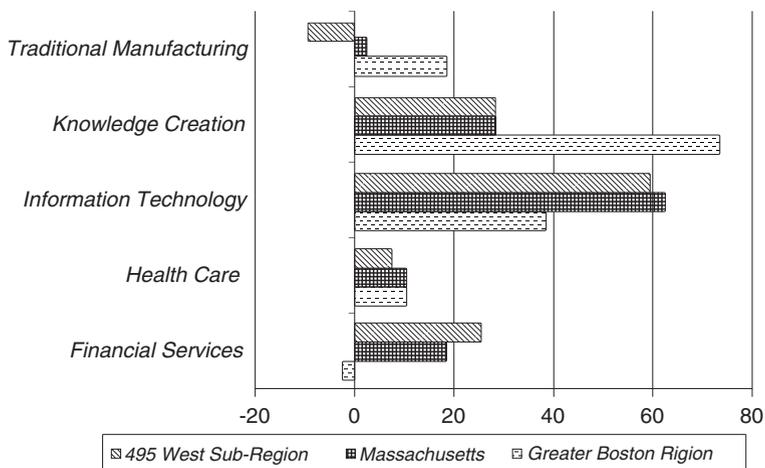
Fig. 8.8 Employment change in the Commonwealth's Export Clusters: Greater Boston Region, 1993–2000 (Swift 2002)
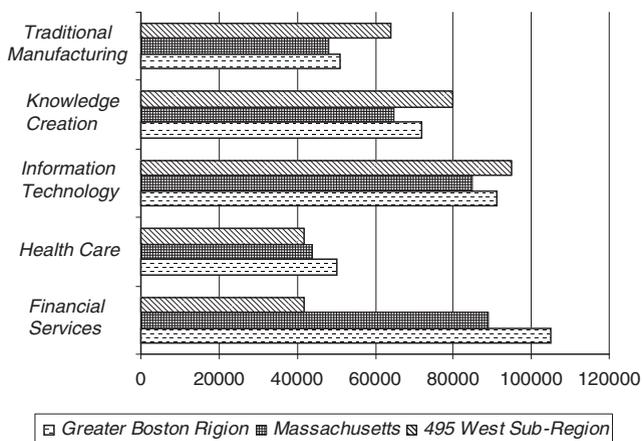

Fig. 8.9 Change in average pay in the Commonwealth's Export Clusters: Greater Boston Region, 2000 (Swift 2002)

The region's economic growth includes several factors. One of them is educated workers, so that many workers without a college education didn't share in this progress.

Another important point can be considered as the price of housing. The price of housing has increased even faster than income growth. By increasing this gap throughout the decade, the region's growth ability will be decreased.

8.11.5 Economic Over View

● *Employment*:

Figure 8.10 shows that unemployment rate in Greater Boston has been under the unemployment rate in the state, over the past decade (it reached to 2.2% in 2000). The distribution of unemployment rate is not the same all over the Greater Boston. For example, the unemployment rate of the west sub-region (I-495) was around 2%.

● *Income*:

Wages in the Greater Boston are much better than wages in the rest of the state. The gap of wages between Greater Boston and rest of the state was 9.5% and it increased to 13% in 2001. In Fig. 8.9, we can see wages in I-495 are even higher than wages in Greater Boston. In addition to growth of income in this region, housing price has more growth so that it creates an estimated affordability gap $31,460 in 1999.

● *Employment by major industry*:

The major activities in term of employment in this region are whole sale and retail trade, manufacturing, Financial, Insurance and Real State (FIRE). Employment grew by 20.7% between 1993 and 2000. Also services have grown by 30.7%, trade (whole sale and retail) by 15.4% and construction by 67.5%. The I-495 west sub-region with a growth equal to 62% was forerunner.

   Figure 8.11 shows that the growth of employment in construction and agriculture surpasses the other activities. Most of the large increase in construction can be attributed to the Central Artery Project, increasing demand for home building services and commercial space. On the other hand, spread of home yard service companies boosted growth in the agriculture sector. This figure also shows day-off in manufacturing. It is because of down sizing of regional manufacturing. Between
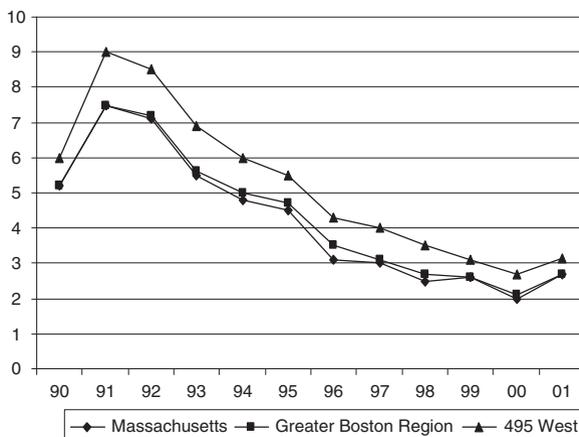

Fig. 8.10 Unemployment rate: Greater Boston Region (Swift 2002)
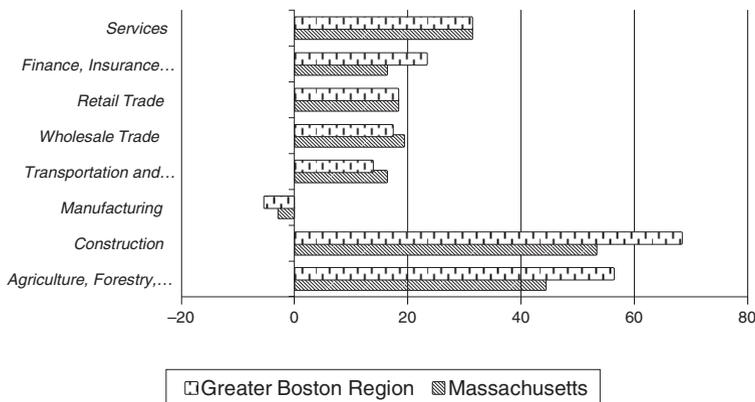
Fig. 8.11 Change in employment, by major industry, Greater Boston Region: 1993–2000 (Swift 2002)

1993 and 1998, 50% of jobs are lost due to plant closing or permanent layoffs in the Metropolitan Area Planning Commission Region (which is slightly larger than the Greater Boston Region) were from the manufacturing sector. Also in 2001, 35.5% of Greater Boston layoffs were in manufacturing, over three times its share of total employment.

8.11.5.1 Export Clusters

The knowledge-intensive export clusters that drive the larger economy of the State are concentrated in Greater Boston. These export clusters are: knowledge creation, information technology, financial services, care health, traditional manufacturing and travel and tourism:

– *Knowledge creation.* The gains that were achieved in this group of clusters include gains of research and testing, engineering and architectural services, and the management, public relations, advertising, and accounting industries. The most balanced growth of clusters belongs to knowledge creation and also most of clusters in knowledge creation grew close to their state wide. By leading the gains appropriately, growth of export industries drives demand for professional business services like management, public relations, advertising and accounting services (see Fig. 8.12).
– *Information technology.* The most effective export cluster in term of employment in this region is the Information Technology export cluster, in a way that growth of it was more faster than average (60% vs. 21%). Two major sectors of IT that absorbed main gains, could be introduced as "computer software development" and "other computer services" (Fig. 8.13). More than 50,000 jobs were created by these sectors between 1993 and 2000.

Over 9% of whole jobs in this region are associated to IT export cluster. The growth of this cluster in the I-495 west sub-region was much faster than its state or region counterparts (see Fig. 8.9). Some of factors that caused this rate of growth in the I-495, could be listed as the availability of land for development, immediate access to major roads, ready access to professional services firms, the cultural amenities their employees desired.

- *Financial services.* This cluster includes three important sectors as follows:

    1. Securities and exchange services
    2. Insurance carries
    3. Banking and services
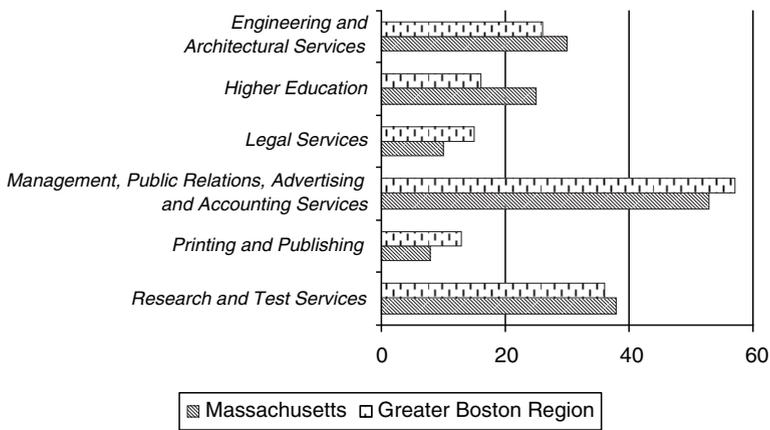
Fig. 8.12 Knowledge creation: change in employment, Greater Boston Region: 1993–2000 (Swift 2002)
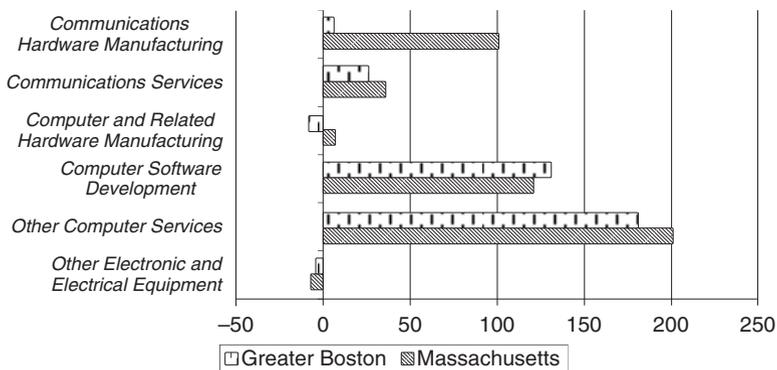

Fig. 8.13 Information technology: change in employment, Greater Boston Region: 1993–2000 (Swift 2002)

The growth of employment in this cluster was close to average of this region (25% vs. 21%) between 1993 and 2000. Employment for securities and exchange services grew dramatically. It is because of rapid rise of stock market during 1990s (see Fig. 8.14).

But financial services employment faced to decrease in the I-495 west sub-region (see Fig. 8.8).

- *Health care.* This cluster where includes teaching hospital and academic research centers, attracts out-state patients and research funds and also causes development of the related medical device and biotechnology sectors. The growth of employment in the Health Care export cluster was less than average of growth of employment in the region (7% during 1993 and 2000). While the drugs and pharmaceuticals sector grew 173%, it still represents less than 3% of total cluster employment in 2000 (Fig. 8.15).
- *Traditional manufacturing.* Share of the traditional manufacturing export cluster in employment after decreasing about 9%, has now been reduced to 3% of Greater Boston employment. Reasons of this reduction have been discussed "economic overview". Figure 8.16 shows changes in traditional Manufacturing sector. The same pattern exists for I-495 sub-region.
- *Travel & tourism.* We can study growth of the Travel and Tourism cluster in Greater Boston by surveying the hotel industries. The gross income in room sale grew about 42% between year ending Jun 1997 and year ending Jun 2000, so that at the end of this period it was about $1.3 billion[6]. Travelers spend usually on meals, retail purchases and accommodations.
- Room sales in Greater Boston exceeded the statewide gains of 37%, and propelled an expansion of the industry.
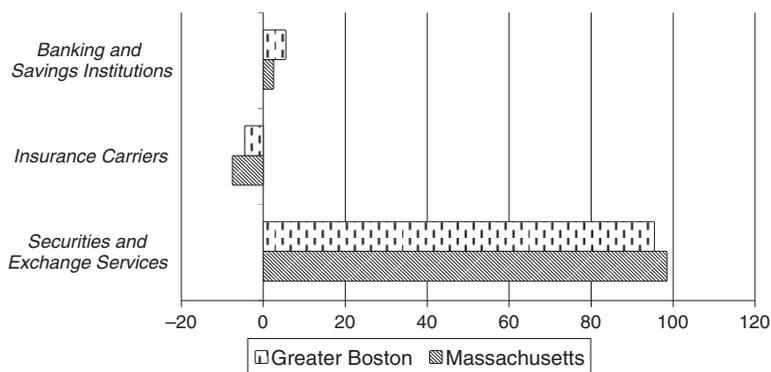

Fig. 8.14 Financial services: change in employment, Greater Boston Region: 1993–2000 (Swift 2002)

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[6] This growth was observed in Suffolk, Middlesex, and Norfolk Counties.
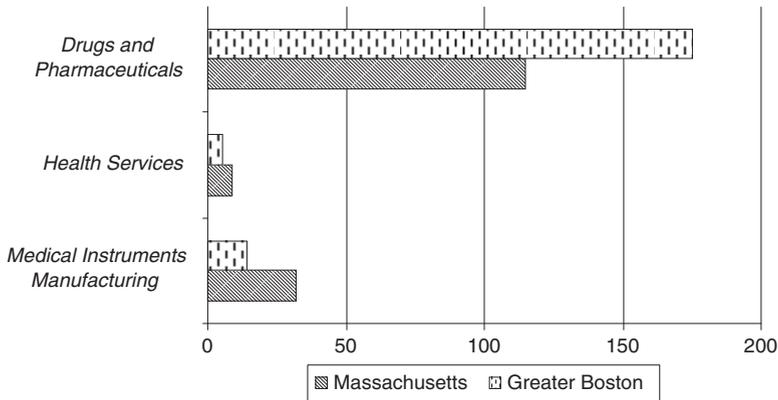
Fig. 8.15 Healthcare, change in employment, Greater Boston Region: 1993–2000 (Swift 2002)
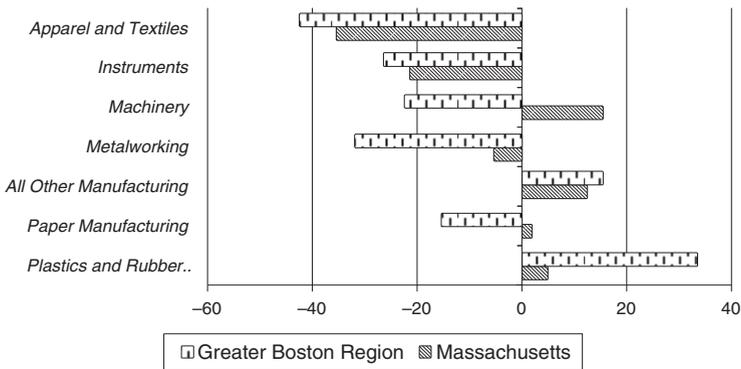

Fig. 8.16 Traditional manufacturing: change in employment, Greater Boston Region: 1993–2000 (Swift 2002)

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