SME clusters in China

One way to build up innovation capabilities

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While SMEs appear keen to adopt new and emerging technologies, they suffer from a lack of innovation facilities and resources. One way to overcome these problems is to develop "clusters", which can provide a platform for SMEs in a region to share innovation facilities and new ideas and production resources through closer business networks. This article describes the character of Chinese SME clusters, which are highly concentrated both geographically and by industrial sector. It compares typical regions of SME clusters and analyzes their innovation capabilities. It concludes that product structure, a favourable innovation environment, learning capability and enthusiasm for innovation are critical to innovation capability in clusters.

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Introduction

According to statistical data for 2005, small and medium enterprises (SMEs) account for 99.3 per cent of Chinese enterprises, 55.6 per cent of national GDP, 74.7 per cent of newly increased production value, 58.9 per cent of sales, 46.2 per cent of revenue, 62.3 per cent of export value, and about 75 per cent of jobs across China. However, in terms of innovation activity in the country, high-tech SMEs generate 80 per cent of all new technologies. About 85 per cent of the patents come from SMEs, during the process of industrialization, and about 65 per cent of the patents is adopted into production by SMEs. In any case, SMEs appear more energetic in adopting newly emerged technologies, especially in the IT sectors.

In a globalizing, knowledge-based economy, SME development in China has been severely affected. Innovation is now a critical force to retain an enterprise's competitive strengths; but SMEs face several limitations in carrying out innovation activities. Their comparatively weak financial and technological backgrounds cannot sustain enormous R&D fees and the fast pace of technology development cycles. It is generally difficult for SMEs to invest in long-term innovation.

However, clusters of SMEs act as a spatial organization, which can provide a platform for SMEs in the region to share innovation facilities, innovative ideas and production resources in a closer business network. This obvious advantage for competition has

attracted the attention of many researchers and policy makers. The cluster strategy has become an important symbol of regional competitive advantage.

Characteristics

Clusters of SMEs are regional agglomerations of SMEs with close business relations and frequent interaction within a locality.

The industrial cluster has been a phenomenon in China, and is especially significant in faster growing economies. One finds similar phenomena in ancient times, such as for needlework in Suzhou, china production in Jingdezhen and rice paper manufacture in Anhui.[1] However a truly rapid development of such a cluster in China has emerged only during the last 20 years, playing an increasingly active role in the regional economy and in industrial development. Today there are thousands of industrial clusters, mainly comprising SMEs. Where high-tech clusters are concerned, SMEs account for more than 95 per cent.[2]

It would be therefore useful to investigate the research on SME cluster development. Where China is concerned, several characteristics can be observed.

Uneven geographic distribution

Although SME clusters have been well established in many regions, their production efficiency and technological contents are unevenly diversified, with imbalanced innovation resource distribution across geographical regions. Statistical data from the Ministry of Information Industry reveal that only some 160 cities out of about 280 produce industrial clusters, of which the major constitutents are SMEs. Most Chinese SME clusters are heavily concentrated in the Pearl River Delta Economic Zone, the Yangtize River Delta Economy Zone, and the Bohai Rim Economy Zone (Figure 1). At the end of 2005, Guangdong province had 21,764 SMEs, the largest number in China, accounting for 12.54 per cent of SMEs in the country. In Zhejiang, the figures were respectively 21,615 SMEs and 12.50 per cent.

Figure 1: Distribution of SMEs in China (2005)
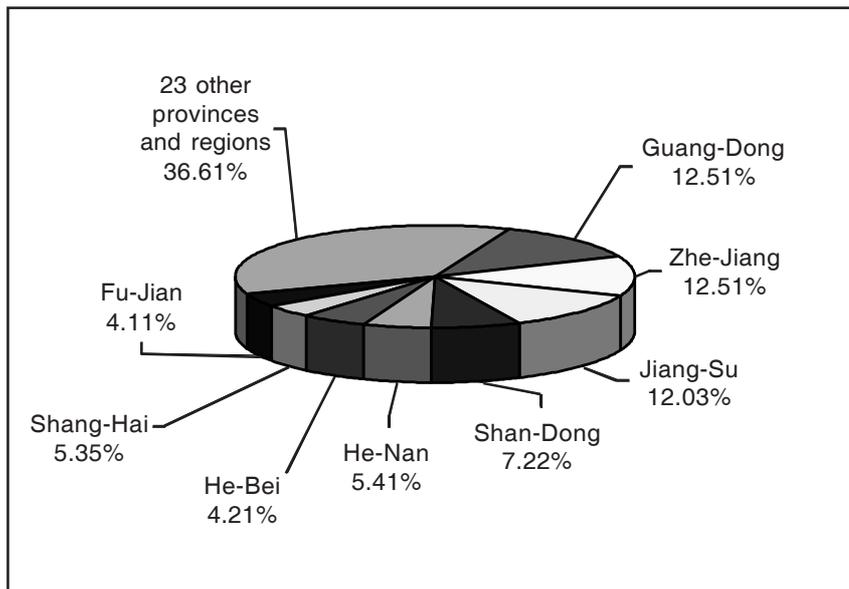
Source: Development of SMEs in China, Yearbook 2003, China Economics Publisher, April 2004.

Table 1: Per capita GDP (RMB) in the three economic zones

Economic zones	2001	2002	2003
Pearl river delta economic zone	11079.96	12203.42	12826.74
Yangtize river delta economy zone	15690.55	17458.8	20371.56
Bohai Rim economy zone	13680.71	14976.08	17130.84

Source: China's Statistical Yearbook, 2002-2004

Regional contrasts

The rapid development of SME clusters has been actively and positively influencing the growth of regional economies. According to statistical data for 2003, SME clusters developed best in Shenzhen, Dongguan, Wenzhou, Guangzhou, Zhongshan, Shanghai, Foshan, Taizhou, Ningbo, Beijing, Shaoxing, Xiamen, Hangzhou, Zhoushan, Quanzhou, Huizhou, Huzhou, Suzhou, Jiaxing. These are the top 20 cities, measured by typical indicators such as per capita income (Table 1).

Records also show that Guang-Dong, along with the related Guang-Dong Pearl Delta Economic Zone, is gradually becoming the largest regional cluster, the fastest developing pace in China, mainly around electronic telecommunication. These clusters are based mainly on sector and technology. For example, Pearl River East Bank (including Guang-Zhou, Dong-Guan, Hui-Zhou, and part of Shen-Zhen) clearly focuses on IT, and the west bank on the electrical and mechanical sectors. In fact, a so-called electronic corridor has gradually emerged, covering telecommunication, computer, home appliances, video and audio equipment, and basic components. Production in these sectors from this region accounts for about 30 per cent of the country's overall production. Within this, the sub-sector of newly developed porcelain-electronic components would probably account for as much as 50 per cent; while intellectualized and energy-saving components, and environment-friendly services would be even higher at about 60 per cent.

Thanks to the rapid development of SME clusters, the Pearl River Delta and Yangtize River Delta Economic Zone have grown into regions with higher social welfare and great financial strength. Especially in Zhejiang and

Table 2: Typical case: Distribution of different sectors in Guang-Dong

Districts	SME clusters
Chaozhou	Hardware production, food, printing and packing, tea, porcelain, electrical machinery, farming and planting, aquatic products.
Dongguan	Electron communication, physical flow, garments, hardware production, trade service industry.
Fuoshan	Spinning and garment, hardware production, woodwork manufacture, aquatic breeds. Flower, shoes, toy, porcelain, construction materials, housing-electric appliance, furniture, poultry and farming, electron, auto-parts.
Guangzhou	Light industry.
Heyuany	Agricultural products and by-products.
Huizhou	Shoe industry.
Jiangmen	Motorcycles and its parts, hardware made through stainless steel, electronic components.
Jieyang	Food and its related machinery, electronic piano, and garments, etc.
Maoming	Ocean products, agricultural products, and fruits and vegetables.
Meizhou	Audio products, porcelain, craft weaving, textile, etc.
Qinyuan	Electronics, porcelain, hardware and manufacturing.
Shantou	Toys, knitting and garments, packaging, fine chemicals, wool weaving, electronics, food, and construction materials.

Guangdong province, the development of SME clusters has been attracting greater attention from business researchers and policy makers.

Regional comparison

SME clusters in China spread very rapidly from east to west, mainly around sophisticated products, which require larger numbers of manufacturing firms to work together in production; such as a motorcycle manufacturing cluster in Chongqing, and the auto parts industries in Guang-Dong and Jiang-Su. Also, sectors with larger varieties of products, such as the lighter and the shoes industries, produce clusters in order to increase efficiency, such as in Wenzhou; and a similar situation can be found in Guangdong province.

The following are the three regions that contain the most important clusters of SMEs in China.

Guang-Dong province

By the end of 2005, according to statistical data from the Department of Science and Technology of Guangdong Province, 139 SME clusters were scattered in regional towns. Some of these geographically defined towns encompass more than one industry, which implies that SME clusters are both intra-industry and inter-industry oriented; and the latter especially can improve sustainability of the local region (Table 2). This is the case in the Guang-Dong area.

Zhe-Jiang province

According to incomplete statistical data (June 2002) from Zhe-jiang, one of the largest SMEs clusters in the region, there were 519 SME clusters in the manufacturing and the agricultural sectors, with a total annual production value of RMB 599.3 billion, accounting for about 49 per cent of the entire province; with three clusters exceeding RMB 10 billion. There are 12 famous SME clusters in Zhejiang - Xiao-Shan textile, Fu-Yang Chun-jiang paper, Tong-lu pens, Zhou-Quan chemical fibre, Pu-Yuan woollen sweaters, Da-Tang socks, Liu-Shi electrical products, Nan-Xun timber products, Shuang-lin mechanical electronic, Hai-ning spinning and weaving, Jin-Tang plastic, and Yun-He wooden toys. Most clusters in Zhejiang are concentrated on labour-intensive industries, such as spinning, garments and machinery (Table 3).

With the rapid development of the SME clusters, the market share and competitiveness of products from Zhejiang are high; and new and high technology SME clusters are emerging, such as the software parks in Hangzhou and Ningbo Districts, and communication equipment in Fuyang.[4]

Jiangsu province

This is a key province in terms of overall GDP contribution. On one hand, Jiangsu Province has one of the largest industrial production bases; on the other, the province generates important SME clusters (Table 4).

Clusters by industrial sector

The distribution and development of SME clusters in China are somewhat influenced by government policies, at both the central and local government levels, which set up high-tech development areas, authorize special economic zones, put in place local preferential tax policies, etc. But SME clusters also develop in a market economy. In places where the market economy is more developed, and the market mechanism more perfect, the clusters are healthier.[3] This is the reason why SME clusters in China are mainly distributed in littoral and special economic zones, where the market is more mature and policies more favourable. In recent years, SME clusters in western China have grown fast under west-developing policies. However, clusters are also generated by the nature of the sectors.

Better in certain industries

It is obvious that SME clusters develop through certain industrial sectors. For example, in Zhe-Jiang province, there are clear clusters covering typically 12 industries - spinning and garments, food products and beverages, electronic and electric equipment, machinery manufacture, furniture production, and so on (Figure 2).

Figure 2 shows that the most obviously clustered industries are spinning and garments, and machinery manufacture. Most of the 12 industries are traditional and labour-intensive. Their strengths are specialized production, informal social relationships and systems of management. They cooperate in order to reduce costs. In contrast, capital-intensive industry clusters based on high and new technology and innovation are a minority. Their technology content and value addition are low. This is visible in the industry cluster in Guangdong province.

According to Zhe-jiang data (Figure 3) clustering takes place in labour-intensive industries. It also happens in high and new technology, like electronics and communication, chemicals and pharmaceuticals. Electronics and communication account for 8.9 per cent, and chemicals and pharmaceuticals for 8.3 per cent.

It is clear that the main part of the SME cluster in Zhejiang is still labour-intensive. This is truly reflective of the nature of SME clusters. SME clusters mainly comprise labour-intensive industries, although there are some high-tech clusters like Zhongguancun in Beijing and Dong-guan in Guangdong.

The main attraction

Most SME clusters in China are "low-cost" clusters. This kind of cluster is not based on innovation to promote regional economy. In these "low-cost" clusters, though firms work in a quite close sector, they rarely communicate, and share very limited information. As a result of lack of trust and collaboration, such clusters do not gain great advantage.

Cluster sizes

Most SME clusters in China with limited innovation capability are small in size, developing slowly, rated low and competitively weak. Technology, quality and labour force are all treated as commodities by companies of this type. Generally, in order to be more successful, SMEs are looking for smaller size and more flexible operations. Smaller firms tend to imitate and learn within the family workshop, and this is what leads to the "one town one product" economy in the countryside.[5]

Table 3: Typical case: Distribution of different sectors in regional clusters

Districts in Zhe-Jiang Province	SME clusters in the nature of industrial sectors
Hang Zhou	Machinery and equipment, electro-communication, electrical appliances, medicine.
Ning Bo	Spinning, printing and dyeing, machinery, pharmaceuticals, chemical industry, chemical fibres.
Jia Xing	Spinning, leather, machinery and instruments.
Hu Zhou	Spinning (feather spin, printing and dyeing), garments, construction materials.
Zhou Shan	Aquatic products, drugs based on ocean products, machinery.
Wen Zhou	Machinery, plastics, packaging and printing, instruments, electronic components/appliance.
Tai Zhou	Auto parts, craftwork, shoes, plastic.
Jin Hua	Machinery, hardware, instruments, farm processing, weaving and spinning, garments.
Qu Zhou	Fertilizers, construction materials (cement), electricals and machinery.
Li Shui	Timber manufacturing, craftwork, farm produce processing.

Data source: Zhu Hua-chen, PhD student thesis, Peking University, 2002

Table 4: Typical regional clusters in Jiangsu province

| Districts in Jiangsu Province	SME clusters
Nanjing	Badminton, electronics and information, medicine, electricity automation.
Xuzhou	Trade service, tourist, supply chain, real estate, food, mechanical, auto-industries.
Suzhou	Weaving, silk weaving and spinning, optical cable, new materials.
Nantong	Electrical tools.
Lianyungang	Agricultural product, tourism, trade finance, real estate, auto-parts, medicine and pharmaceutical administration.
Yancheng	Computer-aided knitting, silk industries.
Yangzhou	Toys, electronic components, glass.
Zhenjiang	Auto-parts, optical electronic components, electrical power and new materials.
Taizhou	Auto-parts, numeral control cutting machine, harbour and ships, chemicals, textile, medicine, electrical motors, etc.

Innovation capabilities

Advantages

The clustering innovation format, so typical of China, plays a critical role in accelerating innovation and competitive advantage in SMEs. There are several reasons for this.

Figure 2: Distribution of technology resource of SMEs in different sectors
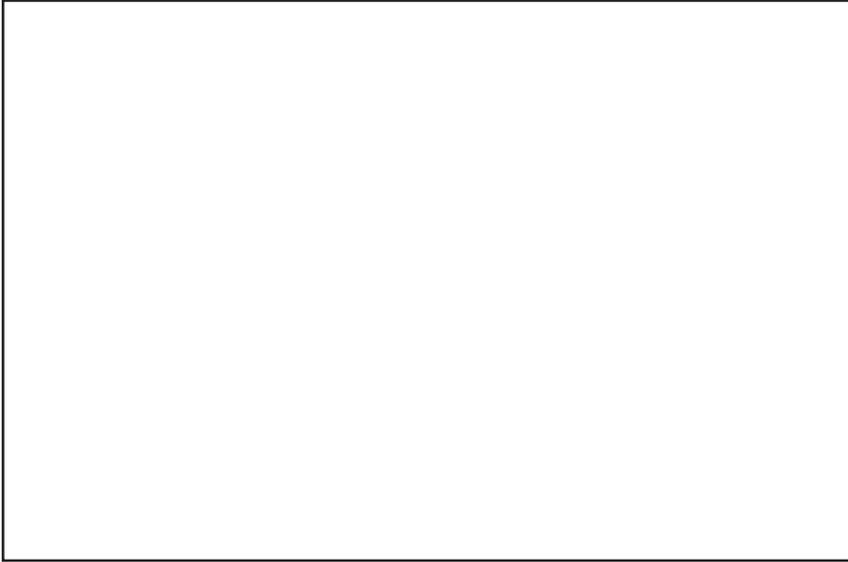
Data Source: China SMEs Development Yearbook 2003, China Economics Press, April, 2004.

Figure 3: Typical SME clusters in Zhe-jiang province

Data source: SME administration (http://www.zjsme.gov.cn)

a) The inflow and outflow of technical personnel lead to rapid technical diffusion. SMEs in certain clusters have similar or related operations. When people change from one enterprise to another, techniques are diffused across companies. This leads first to imitation and thence to innovation.

b) SME clusters not only enhance innovation capacity and flexibility in business operations, but also lead to economies of scale, so necessary for innovation. Usually SMEs face great difficulty in diversification and innovation because of the complexity of high and newer technologies. Their small size - with the

resulting paucity of technical personnel, just-in-time inventory, and finances - inhibits innovation. By clustering, SMEs can overcome these constraints to be able to innovate.

c) The free flow of information in a cluster supports innovation by encouraging "intellectual overflow" among employees of different organizations communicating informally in many ways. As a result of their close contacts, new technologies will diffuse in the cluster and stimulate the next innovation.

d) It is thus easy to form an active innovation culture, as people in the same region generally have the same concepts and follow the same conventions.

Problems and difficulties
Yet, these clusters have limitations. An SME cluster in China would typically suffer from a number of problems.

Low innovation capability
Excessive imitation and inadequate innovation lead to low technology content and value addition. Innovation in SME clusters leads usually to low contributions to the economy, and have very limited effects. Statistics show that the contribution to the economy of such technical innovation is only 30 per cent; while in developed western countries, the figure is more than 80 per cent. So also, the degree of industrialization and commercialization of technical productions is comparatively low. The conversion of technical innovation to practical application is only to the extent of about 20 per cent. Thus the key issue for the next phase of operation of SME clusters is the building up of innovation capability. In order to increase the technical content and value addition of innovations, SMEs need to use higher and newer technologies to improve production.

Low innovation consciousness
High-tech SMEs are an exception in that they are quite active in new technology areas. Many of them are at work exploiting new production methods, as well as taking some management risks, like research, trial-manufacture and

new technology acquisition. In America, more than 50 per cent of technology innovations come from SMEs, but in China's SME clusters, innovation consciousness is not intense, and technical production is low.

On an average, there is less than one technical invention or patent emanating out of each enterprise; and 82.8 per cent of SMEs have no technical inventions or patents at all.[8] Innovation consciousness is weak, and the level of technical equipment low; and these reduce the probability of improving production quality or of added greater value.

Insufficient R&D resources

Most SME clusters lack research personnel for high-end technologies, as well as for management. They also lack employees with experience in foreign trade and with an understanding of international business. In general, employees who have a junior college diploma or above account for less than 10 per cent; those who have senior high school or technical secondary school diploma account for 30 per cent; and those who have junior high school diploma or below account for about 60 per cent.

SMEs in high-tech development areas have more R&D resources available to them than do traditional labour-intensive enterprises. Statistics from the National Bureau of Statistics and the Ministry of Science and Technol-ogy show that the average level of hi-tech SMEs in high-tech development areas is 1.92 per cent, compared to the average international level, which is vastly different. R&D intensity (the ratio of R&D costs to value addition in primary industry) from OECD shows that it is 3.6 per cent in China, 27.9 per cent in America, and 19.1 per cent in Japan. We can see that there is a tremendous discrepancy between SMEs and the highest international levels.

Conclusion

It is clear that the building up of innovation capability has many aspects.

1. The product range within an SME cluster is crucial: if inappropriate, the average value addition of the ultimate product will be low.

2. Clusters need a favourable environment for innovation, including auxiliary services, basic innovation facilities, and financial support.

3. Clusters call for a capability to learn and an enthusiasm to innovate. First, because of close contacts in clusters, imitation is excessive and innovation can be inspired. Clusters also call for mutual trust within.

4. The SME cluster is the result of an opening-up policy and from the comparatively higher levels of technology transfer and technology diffusion. After China joined the WTO, the consciousness of Intellectual Property protection has enhanced gradually, then it might be setting up some obstacles to those companies with less power and technology accumulation to imitate and to collaborate with partners with higher level of technology capacity.

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