

The Innovation Type and Strategy Implemented by Chinese SMEs: Case Study of Manufacturing Industry in Shanghai

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Abstract- *In China, small and medium enterprises (SMEs) play a crucial role in economic development and social wealth in terms of GDP growth, employment creation and poverty alleviation. In the age of technology and information, innovation has been regarded as one of the most significant drivers for the growth and prosperity of SMEs. Therefore, it is necessary for SMEs to implement innovation strategy, which would help them to initiate new products, adopt new processes and increase their competitiveness. From this point of view, this study attempts to identify the innovation situation of Chinese SMEs with regard to innovation type as well as innovation strategy. The research data is collected through structured questionnaires and semi-structured interviews from SMEs of manufacturing industry in Shanghai, China. According to the data results, process innovation and marketing innovation are adopted more frequently than product innovation and organizational innovation by Chinese SMEs. This study also demonstrates most SMEs in China implement free-riding strategy; some of them adopt niche strategy; and few SMEs practice cluster strategy. Although innovation is increasingly important for Chinese SMEs, their implementation of innovation strategy is not highly effective and successful.*

Keywords- *Innovation Type; Innovation Strategy; Manufacturing Industry; SMEs; China*

1. INTRODUCTION

As the largest emerging country in the world, Chinese economy is characterized by high annual rate of GDP growth (e.g. 7.4% for China, 2.4% for the United States and 1.3% for the European Union in 2014) and rapid industrialization advancement (International Monetary Fund, 2015)[7]. SMEs in China covered almost all industrial fields and employed 85% of overall workforces in 2012, making a great contribution on job creation and economic development (Sina News, 2012)[12].

With the rapid acceleration of economic globalization and integration, the marketing competition for enterprises becomes increasingly intense and fierce. Innovation capability has been considered as one of the most vital factors to attain the competitive advantage and achieve the sustainable development, especially for SMEs. The strong innovation capability would help SMEs overcome a lot of challenges in order to gain more profits and expand market shares. Therefore, SMEs should pay close attention to innovation strategy for their long-term development.

There are many researchers and scholars interested in innovation of SMEs, however, few academic researches give more consideration on SMEs from manufacturing industry in Shanghai. The manufacturing industry occupies a vital position and plays a key role in developing country. Since the successful implementation of economic reform and open-door policy in 1978, the Chinese economy has been transformed from highly-centralized planned economy to market-oriented economy

with the flourishing development and prosperity of manufacturing sector (Siu, 2005[11]; Zeng *et al.*, 2010)[19]. For example, the Chinese manufacturing industry accounted for more than 30% of global proportion in 2010 (Zeng *et al.*, 2010)[19].

Therefore, it is very important to analyze the innovation types and innovation strategies applied by Chinese SMEs in manufacturing field so as to enhance their industrial competitiveness. By structured questionnaires and semi-structured interviews, this study aims to investigate 83 manufacturing SMEs in Shanghai where the most developed manufacturing sector in China.

This research focuses on the following key questions that need to be addressed:

- (1) What kind of innovation types and innovation strategies implemented by Chinese SMEs?

To understand the research context, the criterion and current situation of Chinese SMEs as well as the definition and mode of innovation are described. Furthermore, on the basis of different innovation modes, this study will identify the innovation types and strategies adopted by SMEs in China.

- (2) How successful are their innovation strategy?

To assess this question, eighty-three different SMEs from manufacturing industry in Shanghai will be investigated by structured questionnaires. In addition, twelve of them are randomly selected for semi-structured interviews with deeper insights. According to the received data, this research will evaluate the implementation of innovation strategy in terms of success or failure.

- (3) What recommendations can be made to enhance their innovation capability?

Based on the weakness of innovation types and the difficulties of innovation strategy implementation, this study will make appropriate recommendations for Chinese SMEs to figure out their problems and overcome the future challenges as well.

2. LITERATURE REVIEW

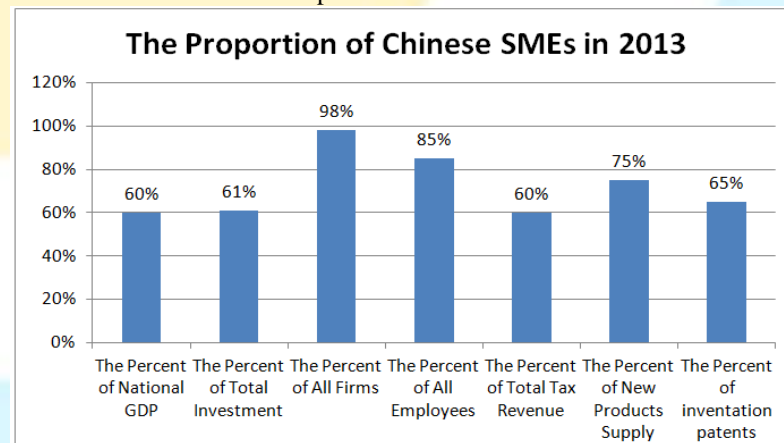
2.1 The Theoretical Explanation of Chinese SMEs

In accordance with the Law of SMEs Promotion issued in 2003 and the standards of Chinese SMEs launched in 2011, SMEs in manufacturing industry define as a firm with less than 300 million RMB (around 43.48 million US dollars) of annual turnover, or less than 2000 employees, or not more than 400 million RMB (around 57.97 million US dollars) of total assets (The Ministry of Industry of the People's Republic of China, 2012)[15]. Compared with the European Union and the United States, the standard of Chinese SMEs is quite broad as the number of employees is less than 2000. However, the requirements of employee numbers are only less than 250 and 500 in the European Union and the United States respectively. This measurement of SMEs in China is more wide-ranging

than in other countries, which makes for a difficult comparison. Therefore, in this research, the definition of SMEs from the American Small Business Administration (SBA) is applied, which is widely accepted and agreed in the entrepreneurship literature. Under the definition from SBA, this study will decrease the number of employees from less than 2000 to less than 500. In reality, the number of enterprises with fewer than 500 staff overwhelms the majority of SMEs in China (Xie *et al.*, 2013[18]; Wolff and Pett, 2000[17]; Zeng *et al.*, 2010)[19].

In recent years, the position and status of SMEs in China have been expanding very quickly. Chinese SMEs not only play a significant role in economic growth, but also offer a large number of new job opportunities and unleash the economic vitality (Xie *et al.*, 2013[18]; Anderson *et al.*, 2003)[1]. For example, in 2013, there were approximately 52.751 million of SMEs in China, which occupied more than 98% of all types of firms. Chart 1 below reveals that Chinese SMEs represented 85% of total employment and provided 75% of new products as well as 65% of invention patents. Moreover, Chinese SMEs also contributed to 60% of national GDP, 61% of total investments and 60% of overall tax in 2013 (China Statistical Yearbook, 2013)[4].

Chart 1: The Proportion of Chinese SMEs in 2013

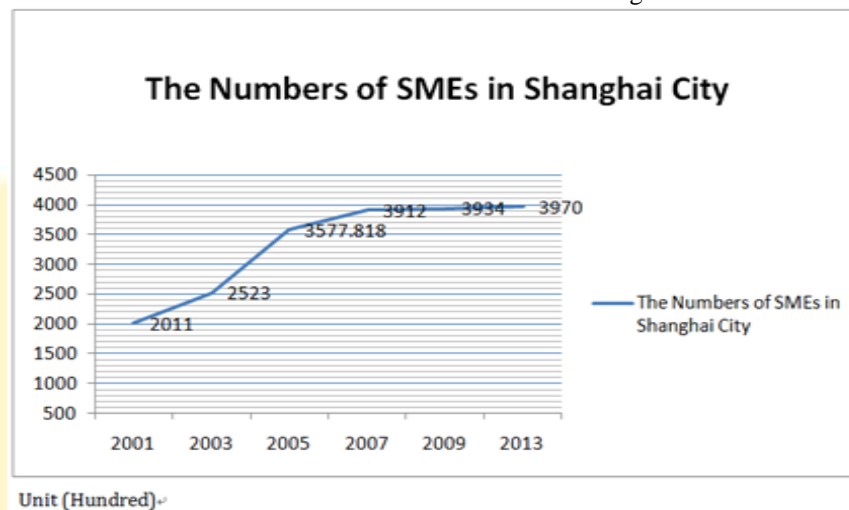


Source: China Statistical Yearbook (2013)

Shanghai City is situated in south-eastern of China, which covers a total area of 6340.5 square kilometers with a population of more than 24 million at the end of 2014. The total GDP was 2.356 trillion RMB (around 341.45 billion US dollars) in 2014, which was 7% of increase than in 2013. As the largest city and most vibrant economic center in China, SMEs in Shanghai have achieved great development and prosperity in terms of the growing enterprise numbers, the increasing annual turnover and employment in the recent ten years. Chart 2

below shows the rising number of SMEs in Shanghai from 201,100 in 2001 to 397,000 in 2013, which increased by 97.41% over a span of twelve years. This occupied approximately 99.6% of overall enterprises as well. In addition, the total turnover reached 3900 billion RMB (around 629.03 billion US dollars) in 2013, representing 74.8% of the overall turnovers. Moreover, there were 8,829,000 workforces employed by SMEs, accounting for 76.2% of total employment at Shanghai in 2013 (Shanghai Statistical Yearbook, 2014)[13].

Chart 2: The Numbers of SMEs in Shanghai



Source: Shanghai Statistical Yearbook (2014)

2.2 The Theoretical Explanation of Innovation

In general, innovation means changing the current ideas and processes, or generating new methods and procedures, which might enhance the possibility of success. With respect to business field, innovation refers to adopt creative ideas, produce ingenious products, improve or develop the existing production processes or marketplaces. From this point of view, four types of innovation are considered, namely product innovation, process innovation, marketing innovation and organizational innovation (Bozkurt and Kalkan, 2014[3]; Guan *et al.*, 2009[5]; Tajeddini, 2010)[14]. Product innovation aims to provide new goods or services for the customers and users. Process innovation includes the main changes concerning procedures, software and facilities. Marketing innovation intends to expand new markets or relocate enterprises' products in the existing markets in order to increase more market shares and boost sales volume. Organizational innovation is regarded as the adoption of new organizational method in business activities, or the changes of company current workplaces and external networks (Bozkurt and Kalkan, 2014[3]; Antonioli *et al.*, 2004, p.19)[2]. Based on two types of innovation (product innovation and process innovation) mentioned above, Wong (1999) pointed out four modes of innovation learning: the product technology pioneering mode, the process capability pioneering mode, the fast-follower innovation mode, and the application specialist mode (Kanamori *et al.*, 2007)[8].

The product technology pioneering mode needs a great capability of product technology. Conversely, this is quite weak concerning process technology. The product technology pioneering mode is widely applied by large companies rather than SMEs. Additionally, it is usually more popular in developed countries instead of

developing economies. For example, iPad and iPhone are introduced and designed by Apple Incorporated in the United States.

Moreover, the process capability pioneering mode concentrates on improving and developing process capability instead of initiating new products. This mode requires less investments and resources than producing new products. One of good examples is the advanced facilities and peripherals of computer production in Taiwan.

Furthermore, the application specialist mode is fit for both product technology and process capability with the low stage, which attempts to be an innovator in the application of existing technologies. This generally works in a commercial field in which complementary skills already existed. Without the intensive capital, researches and resources, this mode is much easier to adopt. However, it might be involved in stagnant risks. The successful implementation of this mode is the Emirates Airlines. On the contrary, there are many failure cases. For example, some of export-oriented SMEs in China are successful, while a large number of them fail to use this mode, especially in current global economic recession.

In addition, the fast-follower innovation mode allows some quick changes from a late-follower to fast-follower through taking full advantage of technology transfer by licenses, strategic alliance or imitative learning. Ultimately, this will become own indigenous capability with the simultaneous maintenance of technological leadership. For instance, in the 1990s, the manufacturing industry of Japanese vehicle achieved the successful accomplishments (Kanamori *et al.*, 2007)[8].

The generic strategies provided by Porter (1990)[9] accordingly accompany these four modes of innovation learning mentioned above. Here, Porter generic strategies, including the niche strategy, free riding strategy and

cluster strategy, will be adopted as the analytical framework in this research. The niche strategy is not only suitable for product technology pioneering mode, but also proper for process capability pioneering mode. This strategy heavily depends on the focus of enterprise, which concentrates on specializing in product innovation or process innovation.

The application specialist mode is to easily free-ride off the available skills and existing technologies, therefore, the free riding strategy matches to this mode. As discussed before, the application specialist mode as well as the free riding strategy is likely to fail owing to the shortage of enough observations for the operating and marketing situation (Kanamori *et al.*, 2007)[8]. Cluster strategy corresponds to fast-follower innovation mode, which is generally implemented by strategic alliances in order to increase industrial competitiveness. Compared to

large firms, the available resources are insufficient for SMEs. Furthermore, SMEs are always frangible to the external environment. Therefore, it is very difficult for them to compete with large enterprises. Cluster strategy provides a great platform for SMEs with closer business connection networks and establishes a communication bridge between different firms. The cluster strategy is also beneficial to the improvement of innovation capacity, the sharing of resources and the promotion of auxiliary industries as well as the spread of marketing information, technology and skills (Rong, 2004)[10]. This would help SMEs to reposition their image from low-end, low-tech producer to high-quality, high-sophistication manufacturer over time (Kanamori *et al.*, 2007)[8]. Figure 1 below summaries the analysis framework explained before to provide better understanding on the context of innovation strategy.

Figure 1: Analytical Framework of Innovation Strategy

		Product Innovation Capability	
		High	Low
Process Innovation Capability	High	Fast Follower Innovation Mode (Cluster Strategy)	Process Capability Pioneering Mode (Niche Strategy)
	Low	Product Technology Pioneering Mode (Niche Strategy)	Application Specialist Mode (Free-Riding Strategy)

Source: Adopted from Wong (1999), Porter (1990) and Kanamori *et al.*, (2007).

3. RESEARCH METHODOLOGY

3.1 Data Resources and Respondent Background

This study aims to evaluate the innovation types and innovation strategies practiced by Chinese SMEs. Research data were collected from SMEs operating at different manufacturing sectors in Shanghai by structured questionnaires and semi-structured interviews. To establish a series of questions analyzed by structured questionnaires, the scopes of innovation types (Guan *et al.*, 2009)[5] and the scopes of innovation strategies (Porter, 1990)[9] were considered. Specially, four scales (e.g. product innovation, process innovation, marketing innovation and organizational innovation) with sixteen questions for the analysis of innovation types, and other four scales (e.g. the product technology pioneering mode, the process capability pioneering mode, the fast-follower innovation mode and the application specialist mode) with twelve questions for the analysis of innovation strategies (e.g. niche strategy, strategic cluster strategy and free riding strategy) were chosen as research variables. The items of these variables are assessed by

five-point Likert scale ranging from “1” to “5” with the following equivalences, “1: quite seldom”; “2: seldom”; “3: averagely”; “4: frequently”; “5: very frequently”. The higher scores imply the greater innovation performance and more effective implementation of innovation strategy.

Based on the firm size (less than 500 workers), the industrial sector (manufacturing fields) and location (Shanghai City), 194 SMEs were selected at random. Accordingly, 194 copies of structured questionnaire were sent by Email in March 2014. However, there were 102 questionnaires received after six months, and only 83 questionnaires were valid. The rate of valid reply is 42.78%. According to Hart (1992)[6], there is no non-responding bias detected with the relatively high response rate (42.78%>30%). To identify more specific details, twelve SMEs from the research sample were contacted with their managers or directors for semi-structured interviews. The background information of research sample is explained in Table 1 and Table 2 below.

From Table 1, we can see that there are 53.01% of private enterprises (PEs) and 31.15% of foreign invested enterprises (FIEs), which is the largest representation of

this research sample. Moreover, 6.02% of state-owned enterprises (SOEs) and 9.64% of collectively-run enterprises (CREs) existed as well. In addition, 56.63% of enterprises employ staff from 50 to 300, and 30.12% of SMEs hire employees from 301 to 500. In relation to the founding years, 22.89% of enterprises establish over 10 years. Furthermore, 69.88% of their founding time is from 3 to 10 years, including 39.76% of SMEs established from 6 to 10 years and 30.12% of SMEs established from 3 to 5 years. There are only 6 companies establish less than 3 years. In terms of annual turnover, 46.99% of

SMEs have an annual turnover from 10 million RMB (around 1.45 million US dollars) to 30 million RMB (around 4.35 million US dollars), and 45.78% of SMEs have an annual turnover with less than 10 million RMB (around 1.45 million US dollars). Lastly, there are 51.81% of enterprises possess total assets from 10 million RMB (around 1.45 million US dollars) to 40 million RMB (around 5.80 million US dollars), and 42.17% of SMEs hold total assets with less than 10 million RMB (around 1.45 million US dollars).

Table 1: Background of Research Sample

Characteristics	Number of enterprisers	Percentage (%)
Ownership		
SOEs	5	6.02%
PEs	44	53.01%
CREs	8	9.64%
FIEs	26	31.15%
Total	83	100.00%
Number of Employees		
301–500	25	30.12%
50–300	47	56.63%
<50	11	13.25%
Total	83	100.00%
Founding Years		
>10	19	22.89%
6–10	33	39.76%
3–5	25	30.12%
<3	6	7.23%
Total	83	100.00%
Annual Turnover (Million RMB Yuan)		
31–300	6	7.23%
10–30	39	46.99%
<10	38	45.78%
Total	83	100.00%
Total Assets (Million RMB Yuan)		
41–400	5	6.02%
10–40	43	51.81%
<10	35	42.17%
Total	83	100.00%

Source: Summarization from 83 SMEs in Shanghai City

Table 2 shows there are 17 different business sections from manufacturing industry in this research, where the section of ordinary machinery accounting for 24.10%. Moreover, electronic and telecommunications equipments as well as electric equipments and machinery represents 15.66% and 10.84% respectively. Most SMEs of this

study are from these three manufacturing fields. The other main sections include textile industry, garments and other fiber products (8.43%), raw chemical materials and chemical products (7.23%), food processing and food manufacturing (6.02%).

Table 2: The Manufacturing Sectors of Research Sample

Manufacturing Sectors	Number of Enterprises	Percentage (%)
Food processing, food manufacturing	5	6.02
Tobacco processing	1	1.20
Papermaking and paper products	2	2.41
Timber processing, bamboo and straw products	1	1.20
Furniture manufacturing	2	2.41
Textile industry, garments and other fiber products	7	8.43
Printing and record medium reproduction	1	1.20
Cultural, educational and sports goods	3	3.61
Petroleum processing and coking	3	3.61
Raw chemical materials and chemical products	6	7.23
Crafts and other industries	1	1.20
Rubber products	3	3.61
Plastic products	2	2.41
Medical and pharmaceutical products	4	4.82
Ordinary Machinery	20	24.10
Electric equipments and machinery	9	10.84
Electronic and telecommunications equipments	13	15.66
Total	83	100.00

Source: Summarization from 83 SMEs in Shanghai City

3.2 Data Results and Data Analysis

After collecting all data information, the results of structured-questionnaires were analyzed by SPSS. The questionnaire results are shown in the following (see Table 3 and Table 4 below).

Table 3 indicates that process innovation is the most common innovation type used by Chinese SMEs. This shows 22.89% of Chinese SMEs changed their existing procedures, equipments or software very frequently, and

38.55% of them did it frequently as well. Moreover, marketing innovation is another main innovation type next to process innovation. On the other hand, this result reveals only 7.23% of SMEs in China applied product innovation very frequently, and 15.66% of them practiced it frequently. Still worse, no any firm adopted organizational innovation very frequently and only two of them implemented it frequently.

Table 3: The Results of Questionnaires (I)

Main Variables	Variables Description	Symbols	Very Frequently (5)	Frequently (4)	Averagely (3)	Seldom (2)	Quite Seldom (1)
			Value				
Product Innovation	Providing new products or service	V1	6 (7.23%)	13 (15.66%)	44 (53.01%)	12 (14.46%)	8 (9.64%)
Process Innovation	Changing existing procedures, equipments or software	V2	19 (22.89%)	32 (38.55%)	21 (25.30%)	7 (8.43%)	4 (4.82%)
Marketing Innovation	Opening new markets or relocate products	V3	15 (18.07%)	26 (31.33%)	28 (33.73%)	9 (10.84%)	5 (6.02%)
Organizational Innovation	Adopting a new organizational method Changing workplace or external relations	V4	0 (0.00%)	2 (2.41%)	5 (6.02%)	59 (71.08%)	17 (20.48%)

Source: Summarization from 83 SMEs in Shanghai City

Table 4 describes the majority of Chinese SMEs from manufacturing industry implemented free riding strategy, which accounts for 37.35% of SMEs with very frequent implementation and 54.22% of SMEs with frequent implementation. In addition, a great number of SMEs also adopted niche strategy, while most of them performed it

in terms of process capability rather than product capability. This result is same as what we discussed before. However, there are only three SMEs adopted cluster strategy very frequently, and five enterprises adopted it frequently. This indicates the cluster strategy is the most difficult for SMEs in China.

Table 4: Results of Questionnaires (II)

Main Variables	Sub-Variables	Symbols	Very Frequently(5)	Frequently (4)	Average (3)	Seldom (2)	Quite Seldom (1)
			Value				
Niche Strategy	Product technology pioneering mode	V5	6 (7.23%)	13 (15.66%)	44 (53.01%)	12 (14.46%)	8 (9.64%)
	Process capability pioneering mode	V6	19 (22.90%)	32 (38.55%)	21 (25.30%)	7 (8.43%)	4 (4.82%)
Free Riding strategy	Applications specialist mode	V7	31 (37.35%)	45 (54.22%)	7 (8.43%)	0 (0.00%)	0 (0.00%)
Cluster Strategy	Fast-follower innovation mode	V8	3 (3.61%)	5 (6.02%)	9 (10.84%)	41 (49.40%)	25 (30.12%)

Source: Summarization from 83 SMEs in Shanghai City

Besides the data received from structured-questionnaires, more details from semi-structured interviews are provided as well. The majority of Chinese SMEs from manufacturing industry focus on low value-added and low-end products like final-products assembly and then exports the finished goods to overseas. Without sufficient capital and technological support, it is easier and quicker to free-ride off the available skills and existing technologies, which is already used by others. However, due to the shortage of core innovation technology and key skills, a large number of SMEs in China failed to implement free-riding strategy. For example, one manager from a medium-sized enterprise in food processing industry said “with the increasing costs of labor force and raw materials, our company cannot acquire competitive advantages by simple export business as before. Even worse, our factory has been suffered a lot with the sharply declining overseas orders from the European Union in recent five years.” Furthermore, over 80% of SMEs managers have complained about the shortage of high-qualified human resources, and more than half of them mentioned the inadequate cooperation between enterprises and research institutions or universities. Therefore, it is hard for Chinese SMEs to develop a new

product or offer new services. For instance, all respondents from semi-structured interviews admitted their companies imitated others’ products to some extent. And over 75% of participants stated that it is difficult for their companies to implement strategies with high efficiency, which generally cannot be successful as they planned.

Furthermore, all interviewees said that their firms used different strategy in different time according to their actual business situation. And more than 60% of respondents agreed that they adopted more than one strategy at the same time to improve their business performance.

4. FINDINGS AND DISCUSSION

Table 5 below summaries that 61.45% of SMEs implemented process innovation and 49.40% of Chinese SMEs implemented marketing innovation, which are the dominating types of innovation. However, product innovation and organizational innovation are not frequently adopted. These results indicate that SMEs in China lack of the advanced technology and high-educated employees with creative ideas as well as managerial skill.

Table 5: The Summary of Questionnaire Results (I)

Main Variables	Variables Description	Symbols	(Very) Frequently	Averagely	(Quite) Seldom
Product Innovation	Providing new products or service	V1	19 (22.89%)	44 (53.01%)	20 (24.10%)
Process Innovation	Changing existing procedures, equipments or software	V2	51 (61.45%)	21 (25.30%)	11 (13.25%)
Marketing Innovation	Opening new markets or relocate products	V3	41 (49.40%)	28 (33.73%)	14 (16.87%)
Organizational Innovation	Adopting a new organizational method				
	Changing workplaces or external relations	V4	2 (2.41%)	5 (6.02%)	76 (91.57%)

Source: Summarization from 83 SMEs in Shanghai City

With regard to innovation strategy, we can see from Table 6 below, 91.57% of Chinese SMEs adopted free riding strategy. Moreover, 84.34% of Chinese SMEs applied niche strategy, but the majority of them practiced process niche strategy (61.45%) instead of product niche strategy

(22.89%). In contrast, few SMEs applied cluster strategy, occupying only 9.64%. Besides the shortage of advanced technology and high-qualified employees, the research results also imply Chinese SMEs should have more cooperation and establish the cooperation networks.

Table 6: The Summary of Questionnaire Results (II)

Main Variables	Sub-Variables	Symbols	(Very) Frequently	Averagely	(Quite) Seldom
Niche Strategy	Product technology pioneering mode	V5	19 (22.89%)	44 (53.01%)	20 (24.10%)
	Process capability pioneering mode	V6	51 (61.45%)	21 (25.30%)	11 (13.25%)
Free Riding Strategy	Applications specialist mode	V7	76 (91.57%)	7 (8.43%)	0 (0.00%)
Cluster Strategy	Fast-follower innovation mode	V8	8 (9.64%)	9 (10.84%)	66 (79.52%)

Source: Summarization from 83 SMEs in Shanghai City

From the findings above, several suggestions are recommended as follows:

- (1) SMEs should recruit and train more innovative talents. To improve the product innovation and organizational innovation of SMEs, the high-qualified staff with technical and managerial skills should be recruited and retained by competitive salary and high welfare. Furthermore, more efforts on staff-training also should be made by SMEs to master more technological skills.
- (2) Moreover, strategic clusters offer the learning opportunities to enterprises with different experiences or knowledge exchange. This would help enterprises to improve and enhance their innovation performance, in

particular SMEs. However, the current clusters of SMEs are mainly situated at export processing zones in coastal regions of East China. In addition, the Chinese SMEs clusters are usually engaged in labor-intensive production such as processing industry and textile industry. The regional and industrial limitations are harmful for Chinese SMEs to create their innovation advantages, which would damage on their sustainable development as well. Therefore, it is necessary to establish more advanced strategic cluster. This not only contains the close cooperation between enterprises or enterprises and their suppliers/customers, but also includes the innovative research cooperation between enterprises and universities/R&D institutions.

(3) Apart from these, Chinese central and local governments also need to provide a favorable environment such as the adequate financial support and legal protection to encourage the innovation activities of SMEs in China.

5. CONCLUSION

This study presents a study of innovation type and innovation strategy implemented by Chinese SMEs using 83 firms from manufacturing sectors in Shanghai as research sample. The analysis of data results shows that Chinese SMEs perform more process innovation and marketing innovation than product innovation and organizational innovation.

Additionally, it is worth mentioning that SMEs in China adopt more free riding strategy and process niche strategy instead of product niche strategy and cluster strategy. Regarding the weaknesses of innovation type and strategy implementation, several advices are provided for Chinese SMEs to enhance their innovation performance in the future.

Due to the restrictions of limited time and resources, this study merely focuses on 83 SMEs from one industry in one region, which might limit the research scope and impact the research results. The future study should expand research areas and samples to offer more valuable knowledge and experiences.

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