

# Towards the Innovation of High-tech Small-medium Enterprises (SMEs): The Interview Approach

Wei Xue<sup>1</sup>, Victor Chang<sup>2</sup><sup>a</sup>, Yijie Chen<sup>3</sup> and Qianwen Xu<sup>4</sup>

<sup>1</sup>Zhonghui Accountancy, Suzhou, China

<sup>2</sup>School of Computing, Engineering and Digital Technologies, Teesside University, Middlesbrough, U.K.

<sup>3</sup>International Business School Suzhou, Xi'an Jiaotong-Liverpool University, Suzhou, China

<sup>4</sup>Independent Researcher, Suzhou, China

**Keywords:** Innovation, Small and Medium-sized Enterprises.

**Abstract:** With the intensive global market competition, the Chinese central government is paying more attention to the innovation of SMEs, especially for high-tech SMEs. This paper conducts the interview approach to investigate the status of innovation and its importance to SMEs in Suzhou. R&D development requires innovation as a key element. Findings from interviewees are positive towards innovation. Innovation has been used throughout the SMEs – from strategies, marketing, products to services. This implementation makes SMEs in Suzhou more competitive than most other cities of China by offering positive thinking and dynamic inputs to produce more creative products and services. However, problems have been identified. Although SMEs are the main body of technological innovation, but it is difficult for them to survive. We plan to propose a framework that contains all factors influencing R&D and carefully set hypotheses. With our mixed-method approach in our future work, we present more results and analysis based on our findings.

## 1 INTRODUCTION

Since China opened up its market, Chinese economic development has been depended on the introduction of foreign advanced technology and investment. But the attractiveness of China to foreign investment has declined with the increase of the labor cost. Now China's economic development model is facing a real transformation under a more intense global competitive situation. China's future economic development inner driver would come from the development of domestic enterprises. Of all these domestic enterprises, small and medium-sized enterprises (SMEs) are the pillar of the national economy.

However, in the long run, Chinese SMEs have been located at the bottom level of the industry chain. They are characterized by low-quality products, low price, or technical plagiarism. If Chinese enterprises cannot move from the current simple processing, low technology content product manufacturing to the high value-added product with independent intellectual property rights, the development will be difficult to

sustain. Chinese enterprises want to survive and develop in international competition only through independent innovation, developing products and production technology with independent intellectual property rights and independent brands. Therefore, in recent years, research on the innovation of enterprises has been the focus of attention in the field of economics.

Tan et al. (2015) indicated that China had become the global largest market and manufacturing factory, and Chinese innovation capabilities have been largely advanced as it experienced 30 years' reform and opened up to the world. China has learned and enhanced much in the innovation awareness through the cooperation with foreign companies and partners (Chung, Leanne, 2014).

## 2 MANUSCRIPT PREPARATION

Some of the Chinese industries have made significant progress in the high technology product development and the business model innovation. McKinsey (2016)

<sup>a</sup> <https://orcid.org/0000-0002-8012-5852>

researched that China performed well in efficiency-driven and market-focused business innovations, like new energy, E-commerce, high-speed train and mobile phones, etc. through this research and survey, they suggested that the Chinese companies had very powerful potentially innovation capabilities. Especially, SMEs are the main body of technological innovation and the most active group of technological innovation. SMEs are the main carriers of the transformation of scientific and technological achievements, and they are playing an increasingly important role in promoting the progress of science and technology, industrial upgrading and economic growth. According to the disclosure of the central government (2018), now more than 70% of technology innovation of China came from SMEs. Xu (2006) analyzed that SMEs have taken more than 65% patents, 74% technological innovation and 80% new product development. However, it is difficult for SMEs to survive for lots of reasons, such as insufficient financial resources, weak ability to bear risk, poor attractiveness to talents, etc. According to the Chinese statistics yearbook (2016), the survival rate of SMEs only arrives at 10% in the recent ten years. Therefore, although SMEs account for most of the technological innovation of China, but their ability or willingness to innovate constantly is not high comparatively. From a long-term perspective, the situation is harmful to the development of China's economy. Then, it is important to understand the status of innovation to SMEs and identify the influencing factors to their ability of continuous innovation.

Small and medium enterprises would have more innovation driving motivation because they are mostly obtaining the profit from the market and the grants from the government (Cohen and Levinthal, 1990; Romer, 1990; and Van Dijk et al. 1997). But actually, the innovation willingness from small and medium enterprises is not very high, because the long-term technical foundation of small and medium-sized private enterprises is so weak that there is insufficient innovation accumulation. Hence, they generally adopt a low-tech and low-cost development strategy. Innovation often requires a large amount of capital, and at the same time, there are larger technical and market risks. Small and medium-sized enterprises' scale is very small, with insufficient financial resources and weak ability to bear risks. Moreover, they are always facing a difficult financing status and a shortage of innovative funds. Some small and medium-sized enterprises have gradually realized the importance of technological innovation to the continuous development of enterprises. Therefore,

they try to implement various innovation activities. However, patent and other intellectual property rights are not protected enough, the enforcement of the law is weak, and the achievements of enterprise innovation are often harmed by other enterprises in the same industry without penalizing. So the initiative of innovation is breaking down.

Radas and Bozic (2009) indicated that SMEs would confront much more challenges if they want to initiate innovation and develop innovation capabilities because SMEs do not have sufficient capital contribution and technological accumulations. Then, how to enhance the innovation capabilities has become the first task for the SME founders or owners and the government.

But so far, most past literature research mainly concentrated on public companies and stated-owned companies because it is much easier to obtain secondary information from the public disclosure. Some literature has investigated the product innovation or R&D research (Zhu et al., 2012).

Innovation should be usually considered as the thought or approach to do something new or different (Garcia & Calantone, 2002). Baregheh et al. (2009) indicated that innovation includes multiple stages in which organizations turn ideas into new or improved products, services, or processes in order to advance compete and differentiate themselves in their market place. The types of innovations Baregheh studied belongs to product or service and process innovation. Kahn (2018) defined product or service innovation as the outcome of the work and process innovation as the change of the process. However, according to Azar and Ciabuschi (2017), it is important to consider not only product or service, and process innovations, but also organizational and marketing innovation. Organizational innovation is introducing an up-to-date method in the enterprise's business operation, management, or relations. By conducting organizational innovation, expenditure on the administration and transaction may be reduced and employee satisfaction may be improved (Rajapathirana and Hui, 2018). Marketing innovation is the implementation of new methods in product design, pricing, promotion, or advertising placement (OECD, 2005). In this paper, the scope of innovation is not limited to technological and includes organizational and marketing innovation.

There are some generally accepted main factors would influence the innovation of enterprises, such as the industry, the scale, the R&D investment amount, the government incentives, the history of the enterprises, the strategy an position of the product, the leader or founder of the enterprises, the competition,

and the economy of the country. But for High-Tech SMEs in China, Deng (2019) and Shan, Sun (2018) suggested that the government policies are primary incentives to push forward the innovation capability of the enterprises. In Deng's research (2019), she found that the main support policies for technology-based SMEs mainly include tax reductions, financial subsidies, and talent introduction policies. However, from her survey, the most obvious benefit for technology-based SMEs is just tax reduction policies.

In 2017, the Ministry of Finance, the State Administration of Taxation, and the Ministry of Science and Technology specifically issued support policies for the deduction of R & D expenses for technology-based SMEs, including the evaluation criteria for technology-based SMEs. Shan and Sun (2018) studied tax policies much deeper. While they affirmed this policy, they identified some questions as well. First of all, since another policy on increasing the pre-tax deduction ratio of research and development expenses in 2018, all types of enterprises that meet the required R & D expenses are subject to a 75% deduction. Therefore, the tax deduction policy in 2017 for technology-based SMEs is not an advantage anymore. Secondly, the restriction of science and technology has raised the threshold for SMEs to enjoy the tax policy. Some SMEs engaged in R & D activities but not meet the evaluation criteria are prevented from enjoying this special policy support. Furthermore, the tax deduction policy has limited support for loss-making technology SMEs. The loss-making technology SMEs are mostly in the initial stage. They face greater risks of R & D failure and investment failure. The demand for various special policies is particularly strong and the tax deduction policy cannot solve their problem promptly.

### 3 METHOD

The research would select the SMEs around Suzhou City, and the research would adopt the "Grounded theory". The "Grounded theory" was first introduced by Barney Glaser and Anselm Strauss in 1965, the principle of the grounded theory is to deduce a conclusion from the interview or the data, so it is also called that how to discover the nature and conclusion from the data. This research method is more useful to appraise the comparative importance of different factors influencing the innovation.

The research would be performed in the case study focusing on the discussion with the talent from the SMEs located in Suzhou cities, which has a

national high-tech industrial base as well as one of the important central cities in the Yangtze River Delta.

Among all the cities in the Jiang Su province, Suzhou's comprehensive strength of scientific and technological innovation has ranked among the top for ten consecutive years. According to the Suzhou government, its total social R & D investment accounts for 2.78% of GDP, the contribution rate of scientific and technological progress reaches 64.5% and the output value of high-tech industries accounted for 47.7% of the total output value of industries (Suzhou Statistics Bureau, 2019). At present, society and economy are constantly changing, and the emergence of high-tech industries has become an important technology to promote economic growth in the century. He (2016) explained three main ways on how high-tech industries promote the development of the economy. First of all, high-tech industries have higher added value, faster update speeds, higher investment returns, and lower investment risks compared with other economic sectors, leading to a large advantage. Secondly, high-tech industries improve the labor productivity of employees effectively as well. Finally, the emergence of high-tech industries changed the traditional technology and promoted the development of enterprises. Therefore, increasing efforts to develop high-tech industries in Suzhou has played an important role in economic growth.

The research would adopt a one to one interview approach. The research is based on collecting evidence and keywords around the core question concerning innovation. This research employs the interview approach for two reasons. On the one hand, the government statistics might mislead the research result because many innovation activities in SMEs are ignored by their survey. The majority of the SMEs do not have a formal or fixed R&D or innovation department internally (Kleinknecht, 1987). Therefore, the data the government collected may not be complete. However, in this research, which focuses on the city level instead of a province or a country level, conducting the interview approach is easier for us to identify the relative importance of different factors to the innovation of SMEs. On the other hand, the interview approach allows the interviewee to express themselves in a more freedom way. Compared with questionnaires or statistics, the information collected from the interviews provides the primary information for research, which is more direct and convincing. The research sample includes 50 employees from 10 SMEs and ten government officers. The names of the sample enterprises are anonymized and their basic information is presented

in Table 1. They have covered several industries, including the Internet, manufacturing, pharmacy, trading, etc. and the years of establishment range from 6 to 25 years.

Table 1: The basic information of sample enterprises.

Enterprise	Industries	Employee No.	Annual Revenue (RMB)	Main Business	Location	Establishment History
A	Internet	195	50M	E-commerce service	Suzhou	2001
B	Manufacturing	320	10M	Trolley manufacturing	Suzhou	1995
C	Pharmacy	270	90M	Traditional Chinese medicine	Changshu	2010
D	Internet	230	66M	IT service	Wuxi	2008
E	Chemistry	350	300M	Raw material	Wuxi	2012
F	Medical instrument	50	20M	Medical test instrument	Suzhou	2011
G	Biology	45	50M	Biology R&D	Suzhou	2013
H	Manufacturing	150	25M	Mechanical pieces of equipment	Suzhou	1999
I	Manufacturing	470	58M	Precision manufacturing	Suzhou	1994
J	Trading	40	80M	International trade	Suzhou	2000
J	Trading	40	80M	International trade	Suzhou	2000

These 50 employees from the enterprises would include the owner or the founder, the CEO, or the general manager, the technology or operation middle level management, as well as high-level employees. The SMEs participants' demographics are shown in Table 2. Among these participants, expect the five employees whose average working experience is four years, other roles' average working experience are all greater than seven years. Besides, most of the participants take part in the innovation activities directly, which makes them suitable to be the interviewees when studying innovations of high-tech SMEs.

Table 2: The participants' demographics from enterprises.

Position	Number of Participants	Average working experience	Number of Participants who attend the innovation directly
CEO/Founder	10	12	10
R&D Manager(or Director)	12	9	12
Operation Manager	9	8.5	8
Employees	5	4	5
HR manager	2	7	1
Quality Manager	3	8	2
Manufacturing Manager	9	9	7
Total	50		45

The interviewees would reply to the questions under the guidance of each theme questions, which allow them to express themselves and show the key points in their thoughts. The interviews were recorded during the process. Two processes were used for coding. First, there was an intensive listening and re-listening to the interviews to take notes of the keywords. Then there was much more careful coding for themes and sub-themes. Some of these themes came from the past literature and some were developed out of the case.

## 4 RESEARCH FINDINGS

When the interview was completed and the interview contents are recorded, the research adopted the approaches suggested by Hou et al. (2014). This research concluded two constructs from the interview participants' disclosure that are "Innovation cooperation" and "innovation orientation". Also, a new concept, "IP transaction platform," was found during the interview.

Summary of selected interviews is presented in Table 3. In the past literature, very little attention has been paid to the Innovation cooperation, except the research performed by De Marchi (2012) is the first one that indicated the influence of cooperation on the R&D. Giovannetti and Piga (2017) performed empirical research and indicated that active cooperation played an active impact on the innovation of enterprises. We did obtain the same response from the interview and discussion with the participants.

Table 3: Summary of selected interviews.

Participant	Expression
Richard(CEO)	1. The innovation investment is huge for our revenue. The investment does not only include the R&D infrastructure investment, now the most significant challenge for us is to attract the talent if there are excellent cooperation opportunities with the research institution and university, but we can also have more innovation activities.
Jackie(R&D)	1. Now we are not worried about the innovation capabilities, but we want to have more opportunities to cooperate with the suppliers or customers. Because sometimes when we have changed the new design. We should find the new suppliers or take some time to explain the new innovation thought to the suppliers or the customers in order to ensure the smooth of the supply chain.
Joe(Quality)	1. Last year, we have a software update on our product, but the suppliers can not ensure the quality of raw material for the product, then the launch date of the new product was delayed for several months. 2. Our new product software update was completed with the assistance of the local industry research institute.

The summary from the interview outcome is as follows. First, innovation is critical to some sectors such as the pharmaceutical and high-tech industry, since they need to implement new concepts and ideas into product development. They also spend a significant amount of funds for research and development. Second, innovation can drive the way that Suzhou Industry Parks can function. Aiming to be competitive in mainland China, innovation has been used throughout the SMEs – from strategies to concepts, from implementations to marketing and from products to services. Third, innovation means it

has influenced the way each business entity works, such as allowing the remote working, portfolio-based outputs and team dynamics. It has changed the businesses to think and act positively, and respond to the markets and customers as soon as possible, and embrace challenges. As a result, innovation has offered positive thinking and dynamic inputs for each individual and organization to produce more creative products and services, and to think ahead of the market response and customer demands (Zhou et al., 2005). For example, private car sharing, smart manufacturing, smart toys and smart caring can be successful and sustainable business models in Suzhou, while other parts of China are still in exploring stages. These interview outcomes can offer valuable knowledge which are not yet in the current literature.

## 5 DISCUSSION

For a significant period of time, studies on innovation activities have been focused on technology and R&D innovation, which was considered as the main factor in improving the performance and growth of the enterprises (Fagerberg, 1994). Some scholars and researches have indicated that innovation in modern industries and businesses should be much broader than the traditional high technology and R&D activities (Marsili & Salter, 2006; Schmidt and Rammer, 2007). The research findings agree with them and found that in high-tech SMEs in Suzhou, innovation is not limited to product or service innovation and process innovation anymore. The concept of innovation can also be implemented in the organization or marketing.

The framework that contains the factors influencing the innovation of high-tech SMEs can be constructed from the interviews and it is shown in Table 4.

The influencing factors can be categorized into external factors and internal factors. External factors include the government, market and third parties. Internal factors consist of innovation capabilities and entrepreneurship.

Firstly, the relevant government policies, such as government subsidy, tax incentives, have positive impacts on the innovation of high-tech SMEs. However, the results of interviews indicate that financial support from the government cannot fundamentally solve the financing problem for SMEs without a good financial environment. In addition, high-tech SMEs require highly relevant laws and protections from the government to protect their innovation achievements.

Table 4: The framework of influencing factors.

	Main Factors	Elements	Key Words from the interview	Numbers of coding from the SMEs	Numbers of coding from the government
External	Government	Support Policies	Tax incentives, government subsidy, official PE/VC, innovation reward	35	20
		Protective Policies	IP law, talent attractive schedule, the transformation of scientific achievements plan	30	18
	Market	Competitor	Current competitors, potential competitors	30	30
		Market demand	Customer demand, potential demand, customer behavior or expectations adjustment	35	15
		Industry	Industry related to infra, technology development, industry structure adjustment	18	10
	Third parties intermediary	Market intermediary	Cost of market intermediary, service of market intermediary, the vitality of intermediary, collaboration capability, the third party transaction platform	37	18
Internal	Innovation capabilities	R&D staff	Number of R&D employees, educations, experience, age	30	29
		R&D investment	Investment amount budget, R&D infrastructure environment (software and hardware)	38	27
	Entrepreneurship	Innovation ideas	New approaches, a new idea, new thought	27	20
		Risk exposure	Gamble, audacious, exposure capability to risk, smart or sensitive to innovations	21	17
		Ambition	To be great, To be the No. 1, etc.	20	5

The influencing factors can be categorized into external factors and internal factors. External factors include the government, market and third parties. Internal factors consist of innovation capabilities and entrepreneurship.

Firstly, the relevant government policies, such as government subsidy, tax incentives, have positive impacts on the innovation of high-tech SMEs. However, the results of interviews indicate that financial support from the government cannot fundamentally solve the financing problem for SMEs without a good financial environment. In addition, high-tech SMEs require highly relevant laws and protections from the government to protect their innovation achievements.

Secondly, SMEs with good marketing capability can grasp technical market requirements or expectations faster; then, they can update their product or service quickly and lead to a positive impact on market performance. In addition, market competition and industry development cause high-tech SMEs to produce a sense of crisis and urgency, thus make pressure into motive force.

Thirdly, innovation cooperation with the third party has a positive influence on the innovation of high-tech SMEs. The results indicate that innovation searches may be difficult for SMEs as most of them do not have much external contact and the cost and time spent on the search may be too high for them. Service intermediaries can help SMEs to achieve a balance between cost and benefit of innovation search as they interact with numerous enterprises and they have become a warehouse with knowledge and

opportunity. With help from these third parties, the innovation of high-tech SMEs will be promoted.

Fourthly, innovation capability is the guarantee of the technological innovation drive of SMEs and the innovation capability comes from the talents. However, according to the interviews, it is difficult for high-tech SMEs to attract high-level talents because most of them cannot afford the increasing employment cost.

Finally, entrepreneurship impacts the innovation of high-tech SMEs positively. With proactiveness, innovation-oriented leadership and strong risk-bearing ability, a high-tech SME is more willing to innovate continuously.

## 6 CONCLUSIONS

The paper presents the status of innovation and its importance to SMEs in Suzhou while adopting a qualitative approach. R&D development requires innovation as a key element. Factors that can influence the success and delivery of R&D can largely impact the effectiveness of products and services in Suzhou. This can also affect its GDP contributions in Suzhou, since it is heavily dependent on revenue from high-tech and R&D firms in Suzhou Industrial Park, Suzhou, China. Findings from interviewees are positive towards innovation. However, problems have been identified. This paper provides guidance for the high-tech SMEs on how to develop and maintain their innovation willingness and capability. In addition, this paper provides references for the local government on how to adopt appropriate approaches to encourage SMEs forward to innovation. We plan to propose a framework that contains all factors influencing R&D and carefully set hypotheses. With our mixed-method approach in our future work, we present more results and analysis based on our findings.

## REFERENCES

- Azar, G., & Ciabuschi, F. (2017). Organizational innovation, technological innovation, and export performance: The effects of innovation radicalness and extensiveness. *International Business Review*, 26(2), 324-336.
- Baregheh, A., Rowley, J., Sambrook, S. (2009). Towards a multidisciplinary definition of innovation. *Management Decision*, 47, 1323-1339
- B. Van Dijk, R. Den Hertog, B. Menkveld, D. Thurik (1997). Some new evidence on the determinants large and small firm determinants. *Small Business Economics*, 9 (4), 335-343
- Chinese statistics year book (2016). National Bureau of Statistics of China. In: <http://www.stats.gov.cn/tjsj/ndsj/2011/indexeh.htm> accessed on 1 February 2020.
- Chung, L. (2014). Headquarters' managerial intentionality and reverse transfer of practices, *Manag. Int. Rev.*, 54 (2), 225-252
- Deng, Y.G. (2019). Research on the Improvement of Independent Innovation Ability of Technology based SMEs—Taking the power industry of Zhuzhou as an example. *Science Technology and Industry*, 19(6), 84-88
- Fagerberg, J. (1994). Technology and international differences in growth rates. *Journal of Economic Literature*, 32(3), 1147-1175.
- Garcia, R., & Calantone, R. (2002). A critical look at technological innovation typology and innovativeness terminology: a literature review. *Journal of Product Innovation Management: An international publication of the product development & management association*, 19(2), 110-132.
- Giovannetti, E., & Piga, C. A. (2017). The contrasting effects of active and passive cooperation on innovation and productivity: Evidence from British local innovation networks. *International Journal of Production Economics*, 187, 102-112.
- He JM (2016). The contribution and role of China's high-tech industry to economic growth. *China Economy and Trade*, (13), 45-45.
- Kahn, K. B. (2018). Understanding innovation. *Business Horizons*, 61(3), 453-460.
- Kleinknecht, A. (1987). Measuring R&D in small firms: How much are we missing? *The Journal of Industrial Economics*, 36(2):253-256.
- Kuo, Y.K., Kuo, T.H., Ho, LA (2014). Enabling innovative ability: Knowledge sharing as a mediator. *Industrial Management & Data Systems*, 114 (5), 696-710.
- Marsili, O., & Salter, A. (2006). The dark matter of innovation: design and innovative performance in Dutch manufacturing. *Technology analysis & strategic management*, 18(5), 515-534.
- McKinsey Global Institute (2016). The China Effect on Global Innovation, October. McKinsey & Company. In <http://www.mckinseychina.com/wp-content/uploads/2015/07/mckinsey-china-effect-on-global-innovation-2015.pdf?bd0bde> on 15 Jan 2016.
- OECD. (2005). The Measurement of Scientific and Technological Activities Oslo Manual. Guidelines for Collecting and Interpreting Innovation Data. In (3rd ed.). Paris: OECD EUROSTAT.
- Romer, P.M. (1990). Endogenous technological change. *Journal of Political Economy*, 78, 71-102
- Radas, L. Bozic (2009). The antecedents of SME innovativeness in an emerging transition economy, *Technovation*, 29, 438-450
- Rajapathirana, R. J., & Hui, Y. (2018). Relationship between innovation capability, innovation type, and

- firm performance. *Journal of Innovation & Knowledge*, 3(1), 44-55.
- Schmidt, T., & Rammer, C. (2007). Non-technological and technological innovation: strange bedfellows?. *ZEW-Centre for European Economic Research Discussion Paper*, (07-052).
- Shan, W.L., Sun, HZ (2018). Problems and countermeasures of R&D expenses additional deduction policy for small and medium sized scientific and technological enterprises. *Journal of Hebei University of Engineering (Social Science Edition)*, 35(4), 12-14
- Suzhou Statistics Bureau (2019). Statistical Communiqué on Suzhou National Economic and Social Development 2018, Available at [http://www.zfxxgk.suzhou.gov.cn/sjjg/sztj/201905/t20190515\\_1165289.html](http://www.zfxxgk.suzhou.gov.cn/sjjg/sztj/201905/t20190515_1165289.html) (Accessed: 27 Jan 2020)
- Tan, K. H., Zhan, Y., Ji, G., Ye, F., & Chang, C. (2015). Harvesting big data to enhance supply chain innovation capabilities: An analytic infrastructure based on deduction graph. *International Journal of Production Economics*, 165, 223-233.
- De Marchi, V. (2012). Environmental innovation and R & D cooperation: empirical evidence from Spanish manufacturing firms. *Research Policies*, 41 (3), 614-623
- Cohen, W.M., Levinthal, DA (1990). Absorptive capacity: A new perspective on learning and innovation. *Administrative Science Quarterly*, 35, 126-138
- Xu, G.H. (2006). Several significant issues related to independent innovation. *Journal of Chinese Soft Science*, Vol (10), 1-10
- Zhu, Y., Wittmann, X., Peng, M.W. (2012). Institution-based barriers to innovation in SMEs in China. *Asia Pac. J. Manag.*, 29 (4), 1131-1142
- Zhou, K. Z., Yim, C. K., & Tse, D. K. (2005). The effects of strategic orientations on technology-and market-based breakthrough innovations. *Journal of Marketing*, 69(2), 42-60.