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The Practices of Micro-Innovation in Chinese Enterprises: Traits, Types and Affecting Factors

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Micro-innovation, a kind of innovative thinking and innovative manner, can be divided into continuous micro-innovation, imitating micro-innovation and independent micro-innovation based on the dimensions of innovativeness, market disruption and repetitiveness in the innovation domain. On the basis of theoretical and empirical research, this paper analyzes the impact of the main micro-innovation affecting factors on micro-innovation types. Affecting factors including productive resources, management resources and external restrictions have a more prominent impact on imitating micro-innovation, while having a lower correlation with independent micro-innovation and continuous micro-innovation. Enterprises should select an appropriate micro-innovation type or different type combinations according to the comprehensive analysis of enterprise internal productive resources, management resources and external restrictions when implementing micro-innovation.

Keywords: micro-innovation, basic types, affecting factors, empirical research.

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Praktyki w zakresie mikroinnowacji w przedsiębiorstwach chińskich – cechy, typy i determinanty

Mikroinnowacje, jako rodzaj innowacyjnego sposobu myślenia i proces innowacyjny, można podzielić na mikroinnowacje ciągłe, imitacyjne i niezależne. Podział ten oparty jest na wymiarach innowacyjności, zakłóceń rynku i powtarzalności w dziedzinie innowacji. W artykule, na podstawie badań teoretycznych i empirycznych, dokonano analizy wpływu głównych determinant mikroinnowacji na kształtowanie ich typów. Determinanty te, do których należą zasoby produktywne, zasoby zarządcze i ograniczenia zewnętrzne, wywierają bardziej znaczący wpływ na mikroinnowacje imitacyjne, a jednocześnie wykazują mniejszą korelację z mikroinnowacjami niezależnymi i ciągłymi. Wdrażając mikroinnowacje, przedsiębiorstwa powinny wybrać odpowiedni typ lub odpowiednie kombinacje różnych typów mikroinnowacji na podstawie

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kompleksowej analizy wewnętrznych zasobów produktywnych, zasobów zarządczych oraz ograniczeń zewnętrznych.

Słowa kluczowe: mikroinnowacje, podstawowe typy, determinanty, badania empiryczne.

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1. Introduction

As China's economy has been confronted with huge transformation pressure in recent years, innovation has become an important way of China's industries to boost economic development and transformation. Many enterprises are setting up R&D bodies and increasing their R&D investment to enhance enterprise innovation capability and develop core competitive strengths (Yang and Gao, 2013). However, not all enterprises have sufficient R&D capabilities. Many SMEs (small and medium-sized enterprises) have no sufficient capital to launch R&D, and are not capable of bearing huge R&D risks. Therefore, many SMEs are starting to explore new appropriate innovative models. At the 2010 Chinese Internet Grass-Root Startup and Employment Sub-Forum Conference, Zhou Hongyi, President of Qihoo 360 Technology Co., Ltd, advised Internet grass-root startups to be dedicated to micro-innovation, which then attracted the attention of many Chinese entrepreneurs and theoretical researchers.

Micro-innovation, as an important method of enterprise innovation and startups, has its applied environment. Micro-innovation is in line with the demands of Chinese enterprise innovation, especially those of SMEs. However, theoretically, research on micro-innovation has not formed a complete system. Generally, micro-innovation does not highlight technological breakthrough, but emphasizes the application of technology, i.e. applied innovation (Jin, 2010). Micro-innovation can be a slight adaption of technology, and can also be an adaption of product technology, service, technics (process), or business model based on innovativeness. Many people tend to confuse micro-innovation with imitating innovation, and some scholars confine micro-innovation to a minor adaption of technology. Although some scholars have begun to stress that micro-innovation is an indication of innovative thinking (Saariluoma et al., 2009; Zhao, 2012), systematic research is still lacking on micro-innovation. On the whole, there is less research on micro-innovation, and most research is confined to concept definition and experience sum-up, lack of clear and systematic theoretical system and scientific empirical research. On the basis of the theoretical analysis and empirical research of Chinese enterprise innovation, this paper empirically analyzes Chinese enterprise micro-innovation types, affecting factors and their correlation. Practically, the number of China's registered SMEs was over 42 million by the end of 2013. It is not an easy job for such a great deal of SMEs to innovate continuously. If China's SMEs can realize an orderly scale innovation, that will be conducive to the Chinese industry's economic transformation. The chapters of this paper are arranged as follows: firstly, micro-innovation is classified based on the analysis of micro-innovation definition, and its basic traits and affecting factors are summarized in three dimensions: innovativeness, market disruption and repetitiveness in the innovation domain; secondly, correlations between micro-innovation affecting factors and its types are investigated empirically based on the research data of China's SMEs innovation; lastly, discussion and conclusions about theoretical and empirical research results are presented.

2. Implications and Traits of Enterprise Micro-Innovation

2.1. Implications of Enterprise Micro-Innovation

Up to date, there have been no mature theoretical system and strict definition of micro-innovation, but most scholars demonstrate consistent attitudes toward its

basic attributes and implications. According to Zhou Hongyi (2010), micro-innovation refers to a single breakthrough point. The single point is the sweetest place touching users' hearts. One well-solved tiny problem can produce a great effect (Sun, 2013). According to Jin Cuodao (2010), micro-innovation does not stress technological innovation but emphasizes technology application, indicating that micro-innovation highlights application innovation based on user experience firstly and is consumer-centric. As claimed by Saariluoma et al. (2009), micro-innovation is relative to macro-innovation, and it refers to key innovators' innovating process including innovative thinking, innovators' information flow and key information flow as a micro-innovation process. According to the definition by Zhao Fuchun (2012), micro-innovation is a gradual innovation highlighting each party's participation and feedback, which relies on leading innovation platform/design with staff's innovative initiative as a base, and on partially improving a process, product and service, etc., as a means. Sun Renxiang (2013) pointed out that the fundamental purpose of micro-innovation is to improve user experience. Micro-innovation refers to enterprises' gradual adaption of products based on user experience, so as to enhance customer value and satisfy users' psychological demands. To sum up, micro-innovation does not highlight a technological breakthrough, but focuses on adapting product technology, service, technics (process) and business model from one or several perspectives or it micro-innovates something the market has not tapped into to generate new product traits or identify new customers.

Based on the current research, this paper defines micro-innovation from the perspective of innovation content. As a kind of innovative thinking and manner, micro-innovation is an open innovative model which slightly adapts product technology, service, technics (process) and business model, and then generates new product traits or identifies new customers. Accordingly, the implications of micro-innovation include: (1) micro-innovation is a consumer-centric innovative activity which improves user experience and slightly adapts product and service, etc., and then improves customer value and satisfies user psychological demands; (2) micro-innovation, highlighting user participation, is an open innovation which closely follows users' explicit demands or identifies users' potential demands. Micro-innovation can be realized solely by enterprises or completed jointly by enterprises and their stakeholders with higher innovative openness; (3) micro-innovation is not merely a slight innovation in technology, but also an adaption of a business model with a broader innovative scope; (4) micro-innovation stresses newly-generated product traits or newly-identified market users. Micro-innovation does not emphasize the induced great market disruption. It can be called micro-innovation only if it can generate new product traits or identify new users and at the same time has an innovative process.

2.2 Traits of Micro-Innovation

Micro-innovation is an innovation category. As a new theory in the innovation area, it has both the general traits of innovation and special traits of micro-innovation. According to the implications of micro-innovation, it has the following 6 traits:

(1) All-round openness: micro-innovation emphasizes user participation. It can be realized solely by enterprises, or jointly by enterprises and stakeholders who participate in the process and offer feedback. It is an open innovation and the key is the participation and feedback of participants including users and suppliers, etc. (Zhao Fuchun, 2012).
(2) Broad penetration: micro-innovation does not stress technological breakthrough. Enterprises can both slightly adapt technology and micro-innovate product technology, service, technics (process) and business model, etc., from one or several perspectives, rather than be confined to technology or certain perspective. It has a broad scope.
(3) Duality: micro-innovation has the duality of gradualness and disruptiveness. Its result will be new product traits and/or recognition of new users. It can either be gradual innovation inducing market fluctuation or disruptive innovation leading to market disruption.

(4) Fast iteration: micro-innovation does not highlight the pursuit of perfection, but attaches importance to innovation speed. Seeking for what disappoints users and making quick responses before competitors, enterprises then bring products meeting users' demands to the market and make a gradual adaption toward perfection based on feedbacks.
(5) Trial and error: micro-innovation stresses trial and error through which to remove the defects of products so as to meet user demands. For example, Taobao internal team makes quick responses when little innovation ideas occur, quickly transforming innovation ideas to projects. Taobao team will adjust accordingly as per market feedback and introduce constant innovation. A project will be terminated quickly to control risks if it cannot arouse market responses.

3. Major Types and Affecting Factors Analysis of Enterprise Micro-Innovation

3.1. Types of Enterprise Micro-Innovation

3.1.1. Foundation of Enterprise Micro-Innovation Types

There is wide research on innovation classification. For instance, in Rosanna Garcia et al. (2002), innovation is classified into fundamental innovation, moderate innovation and gradual innovation based on its size. According to Wu et al. (2007), innovativeness is classified into fundamental innovation, moderate innovation and gradual innovation based on its extent. This paper attempts to classify micro-innovation from the perspective of innovativeness, market disruption and repetitiveness in innovation.

Innovativeness is a measure of product potential discontinuity (Wu et al., 2009). It can reflect the innovative extent of enterprise micro-innovation. Higher innovativeness will induce market disruption, leading to fundamental innovation, while lower innovativeness may be the continuity of original product performance and then the potential of micro-innovation can be predicted through its innovativeness. Rosanna Garcia et al. (2002) argue that enterprise innovativeness refers to the tendency of enterprises to engage in innovation, or the tendency of enterprises to adopt innovation. Highly innovative products represent the products with great creativity while poorly innovative products refer to slight creativity of products (Zhang and Chen, 2007). Innovativeness refers to the speed/extent of accepting or adopting innovation from ideology and action. In this paper, micro-innovation is classified by the speed/extent of accepting or adopting innovation in action. Micro-innovation takes innovativeness as a prerequisite, and the extent of innovativeness will affect the large/small extent of micro-innovation.

Market disruption measures whether micro-innovation can induce market changes or meet consumer demands. S-shaped Market Curve (S Curve) is often used to describe market disruption. The S Curve measures the result of market changes induced by innovation which may lead to disruptive changes or sustain the original market (Wu et al., 2007). The S Curve reflects whether enterprise micro-innovation can generate a market effect or reflects the innovation value of micro-innovation. The early market stage is the trial period of a product or service, so the growth of market response is slow. With the maturity of the market and the micro-innovation of products or services, consumer market responds to products or services more strongly and quickly. When a market bottleneck emerges, continuing innovation will not make a distinct impact on the market. Until a new market brought about by innovation emerges and substitutes the original one, this will induce market disruption and generate a new S-shaped curve (Wu et al., 2007). Whether micro-innovation can lead to market disruption or not reflects a small/large extent and strong/weak result of micro-innovation. When micro-innovation leads to market disruption, its innovative intensity will be high and it will induce great market fluctuations; otherwise, if micro-innovation does not induce market disruption, its intensity will be weak and will lead to small market fluctuations.

The repetitiveness of innovation describes the repetition extent between an enterprise innovation sphere and that of the leading enterprises, which reflects the extent to which an enterprise meets

users' explicit and implicit demands and also reflects the novelty extent of micro-innovation. Low repetitiveness in the innovation domain indicates that an enterprise has a large innovation extent in the weak sectors of leading enterprises. For example, leading market players have a core capability in product technology, and then other enterprises micro-innovate one or several aspects of service, technics (process), and business model. Under such circumstances, innovation repetitiveness would be low. Innovation repetitiveness reflects the way of micro-innovation. The lower innovation repetitiveness, the larger extent of enterprise independent innovation is.

3.1.2. Basic Types of Enterprise Micro-Innovation

Based on the innovativeness, market disruption and repetitiveness of innovation domain, micro-innovation can be split into imitating micro-innovation, continuous micro-innovation and independent micro-innovation. Continuous micro-innovation refers to the innovation manner where an enterprise is engaged in imitating or independent micro-innovation, but its innovation results do not induce market disruption. Imitating micro-innovation refers to the innovation where an enterprise is engaged in an imitating innovative process and leads to market disruption. Independent micro-innovation refers to the innovation manner where an enterprise is engaged in an independent innovative way and leads to market disruption.

(1) Imitating Micro-Innovation

Imitating micro-innovation represents enterprises' imitating innovative activities and is micro-innovation based on an original product technology, service, technics (process) and business model, inducing market disruption. Though innovation repetitiveness is high, imitating micro-innovation can cause market disruption and bring new users. It enhances the performance of original products and increases the number of new users, but it cannot dig out potential demands of new users. Mostly, imitating micro-innovation is a moderate and gradual innovation.

External information about market promotions, suppliers and users can provide enterprises with opportunities to acquire useful information like market demand and technology. The acquisition of external technological innovation is a gradual process (Zhang and Guan, 1998). Through market promotions, many Chinese enterprises gain market information to learn external technology and then introduce micro-innovation according to market demands. These enterprises adapt current technologies and enhance product performance to create a market effect and increase the number of new users. However, the so-called promotion learning innovation does not focus on users' potential demands, but follows the original demands and further meets them. Some other enterprises gain market information from suppliers and then take actions to introduce innovation or take adapting actions because of the change of suppliers' raw materials. Both actions will enhance product performance. Such a kind of micro-innovation called supplier-impelled innovation does not focus on users' potential demands, but further meets user demands through suppliers. Market leading users' feedback on products is an important innovation source and direction for enterprises' micro-innovation. Based on the leading users' feedback, enterprises make trials and errors quickly to meet users' explicit demands. Such a kind of innovation is called leading users propelled innovation.

(2) Continuous Micro-Innovation

Continuous micro-innovation refers to enterprises' imitating or independent innovation which does not cause market disruption. The result is only competition in the original market. It does not bring new users or identify new potential demands of users, but only adapts current products or services to keep the original market. Most continuous micro-innovation is gradual innovation.

Different enterprises have different internal and external conditions, though different enterprises of the same industry may have similar external environment. For instance, the government policy has a similar impact on enterprises of one industry. With regard to many Chinese enterprises, the government policy has an important impact on enterprises, namely on whether they innovate, and types of micro-innovation adopted. Besides, industry technology substitution and market competition can affect micro-innovation, too. The deeper the substitution of industry technology and

the fiercer the competition, the less the enterprises are likely to choose independent innovation and the more they are likely to choose imitating innovation (Huang Xing et al., 2011).

First and foremost, when the government policy is in favor of micro-innovation, the government, by increasing capital support for example, can boost the development of enterprises' continuous micro-innovation; when the government policy goes against micro-innovation, it may stop or prevent enterprises' micro-innovation from developing. This is called **policy-induced innovation** which does not increase the number of new users or identify potential demands. Such innovation is the continuity of the original market. Secondly, few Chinese enterprises are willing to introduce long-time independent innovation for the short-term effect of technological achievements when the substitution of industry technology is fast. That is why Chinese enterprises choose imitating micro-innovation. When other conditions stay the same, substitution speed of industry technology will affect the direction of continuous micro-innovation. Slow substitution will make enterprises turn from continuous micro-innovation to independent micro-innovation. Quick substitution will make enterprises turn to imitating micro-innovation. This is called **technology substituted innovation.** Lastly, more fairness of market competition, which reflects industry competition, is more favorable for enterprise innovation. Enterprises will introduce micro-innovation in order to maintain fair competition and competitive strengths. Such a kind of micro-innovation is called **market-oriented innovation**.

(3) Independent Micro-Innovation

Independent micro-innovation indicates enterprises' independent innovative activities with lower repetitiveness, i.e. high independent innovation will lead to market disruption and identification of users' potential demands.

Most independent micro-innovation is fundamental innovation which digs out potential demands and induces market disruption, but also may be gradual and moderate innovation. Zhang Huasheng et al. (1998) argue that, as far as enterprises with R&D capabilities are concerned, technological innovation can often bring major or even fundamental innovative results. Enterprise internal R&D results will give a dramatic impetus to its independent innovation, which is called **internal R&D innovation.** The result will often induce market disruption or dig out users' potential demands. To lower R&D risks, enterprises also would outsource R&D to scientific research bodies and universities, etc., which is called **technology outsourcing innovation**. It is also possible for enterprises to gain technology and market information by means of cooperative innovation or introduce independent innovation via technology alliance. Such micro-innovation is called **industry alliance innovation**.

3.2. Affecting Factors Analysis of Enterprise Micro-Innovation

3.2.1. Productive Resource Factors Affecting Enterprise Micro-Innovation

Scholars have interpreted innovation affecting factors from different angles. Smallbone et al. (2003) point out that a shortage of capital and low return on investment are the major impediments to SMEs innovation. Research in Hewitt-Dundas (2006) shows that a shortage of capital and information, high innovation risks and lack of innovative cooperation partners are the main obstacles for SMEs. In conclusion, a shortage of capital is one of the major hindrances affecting SMEs innovation. Through the investigation of technological innovation activities of 1051 Chinese enterprises, Gao Jian et al. (1996) and Zhang (2006) point out that a lack of talents, capital, information and an unfavorable system are the four major impediments to Chinese enterprises' technological innovative activities. According to An Tongliang et al. (2005), the major obstacles for SMEs technological innovation include scant innovative factors, weak innovative awareness and incomplete legal system, etc. (An and Fang, 2005). Based on the investigation of SMEs in Shanghai and Shenzhen, Xie Xuemei (2009) observes that SMEs technological innovation affecting factors include technology innovative talents, capital and entrepreneurship, etc. To sum up, the innovative talent is an important factor affecting SMEs innovation. Furthermore, innovative equipment is also an important factor impacting enterprise innovation. Scholars have done deep research about innovation equipment. On the one hand,

innovation elements are classified into main body, resource and environment elements, among which environment elements include internal software and hardware environment as well as external network environment. On the other hand, innovation elements are classified into direct and indirect elements, among which indirect elements include basic infrastructure, etc. (Liu et al., 2011; Li et al., 2014). Therefore, this paper selects innovation capital and professional talents as internal productive resource factors affecting enterprise micro-innovation.

3.2.2. Management Resource Factors Affecting Enterprise Micro-Innovation

DeHayes et al. (1990) point out that an effective management system, leadership, management team, market centralized capability, technology development capability, information technology strategy and strategic alliance are the main factors to achieve success of enterprise technological innovation. Kim et al. (1995) indicate that professional organizations and high-level managers have a distinct impact on SMEs innovation. Ghosh et al. (1996) point out that an effective management system, good customer relationships and marketing system are the key factors of successful SMEs technological innovation. Above all, scholars highlight the significance of corporate organizational structure for innovation. Hurley (1995) argues that innovative cultural traits are significant for organizational performance. Chesbrough et al. (2003) point out that the successful implementation of a corporate open innovative strategy depends on an open innovative culture. According to research by Hurley (1995) and Chesbrough (2003), an innovative culture has an important impact on corporate innovation. An Tongliang (2005) and Xie Xuemei (2009) consider that entrepreneurship is the main factor affecting SMEs technological innovation. Therefore, this paper takes corporate organization, innovation culture and the management's innovative spirit as management resource factors affecting corporate micro-innovation.

3.2.3. External Restrictions Affecting Enterprise Micro-Innovation

Both internal factors and external restrictions will affect micro-innovation. An Tongliang (2005) points out that an imperfect legal system is one major impediment of SMEs technological innovation. Huang et al. (2011) describe that environmental dynamics is an important factor of corporate risk perception that will finally affect the selection of innovation models. Environmental dynamics is the frequency and extent of environmental changes. Dess et al. (1984) point out that environmental dynamics is a common result of several factors including the government policy, corporate scale changes, the number of enterprises in the same industry, scientific and technological changes, technology diffusion and market risk. Liu (2012) proves that enterprises with the government support have stronger innovation capabilities. The aforementioned scholars emphasize the importance of the government policy for enterprise innovation. Hewitt-Dundas (2006) points out that high innovation risk is one of the main impediments to SMEs innovation. According to Yang Jianjun (2009), innovation risk is one factor affecting corporate technology. Consequently, innovation risk has an important impact on the selection of corporate innovation types. Besides, market demand is also a key factor affecting corporate innovation. According to Geroski et al. (1995), the demand factor stimulates corporate technological innovation. Crepon et al. (1998), through empirical research, prove that the enterprise innovation output has a direct relationship with the R&D input and demand factors. Sun et al. (2010) believe that insufficient effective demand and a low-end demand structure are key factors restraining the enhancement of industry innovation capabilities. Accordingly, this paper takes laws and regulations or standards, innovation risk and market demand as external restrictions affecting corporate micro-innovation.

Based on the above analysis, the paper will analyze corporate micro-innovation affecting factors from the categories of corporate productive resources, management resources and external restrictions. Corporate productive resources include innovation capital and professional technological talents. Management resources include organizational setting, corporate innovation culture and innovative entrepreneurship while external restrictions include government policies or standards, innovation risks and market demands.

3.3. Correlation Analysis of Enterprise Micro-Innovation Types and Its Affecting Factors

(1) Correlation between Innovation Elements and Enterprise Micro-Innovation Types

Innovation elements, including innovation capital and professional technological talents, are enterprise innovation related resources and capabilities. Based on the theory of resource-based view (RBV), abundant resources can facilitate technological innovation while capital deficiency makes it hard for enterprises to develop through innovation or even upsets innovation performance (Yu et al., 2013). The lack of innovation elements notably stops enterprises from innovation activities. According to Smallbone et al. (2003), capital deficiency and low return on investment are main impediments of SMEs innovation. An (2005) points out that the deficiency of innovation elements is the main obstruction to SMEs technological innovation, which includes the deficiency of innovation capital, lack of high-quality professional talents and inadequacy of information capability. On the other hand, technological talents have an important impact on innovation activities, which is the key element of SMEs product innovation and technique innovation (Bougrain and Haudevil, 2002). Branzei et al. (2006) believe that the development of human resources can strengthen enterprises' internal innovation capabilities. In Hewitt-Dundas (2006), the effective configuration of technological talents determines an enterprise's innovation. When the innovation element input is sufficient, enterprises will choose independent innovation to make full use of resources and improve competitive strengths; when the innovation element input is insufficient, an enterprise may choose imitating micro-innovation based on the mature technology to overcome resources deficiency and reduce innovation cost. Relatively speaking, continuous micro-innovation can be independent and imitating; therefore, innovation elements have little impact on continuous micro-innovation. Hypothesis 1 is thus put forward:

H1: An enterprise tends to choose imitating micro-innovation when the innovation element is deficient.

(2) Correlation between Innovation Risk and Enterprise Micro-Innovation Types

Innovation risk has an important impact on enterprise innovation activities, especially on that of SMEs which lack enough capital and strength to undertake large-scale R&D activities and which cannot bear huge innovation risk, so high innovation risk will upset SMEs innovation. Hewitt-Dundas (2006) argues that high innovation risk will mainly obstruct SMEs innovation activities. Wu (1996) believes that technological innovation is the main impediment to China's industrial enterprise technological innovation. Enterprise technological risk depends on the uncertainty of external environment, the limitation of enterprise self-capabilities, and the difficulty and complexity of projects (Xie, 1994). Uncertainty is a prominent trait of enterprise innovation risk. The higher extent of innovation, the more uncertainty and the higher risk of enterprise innovation is (Zhou Jizhong, 2002). Imitating micro-innovation makes an adaption of mature market technology with some knowledge about the market and low uncertainty of external environment. Besides, the imitating micro-innovation needs less innovation resource input (e.g. capital, technological talents), and its risk is relatively low. Relatively speaking, independent micro-innovation needs more input with high uncertainty and high innovation risk. An enterprise thus tends to choose lower risk imitating micro-innovation to reduce risk when the enterprise innovation risk is high. On the contrary, an enterprise tends to choose the independent innovation model when the innovation risk is low (Yang Jianjun, 2009) to meet the demands of the enterprise's long-term development and to promote the development and enhancement of its core capabilities. Hypothesis 2 is therefore put forward:
H2: An enterprise tends to choose imitating micro-innovation when innovation risk is overly high.

(3) Correlation between Innovation Awareness and Enterprise Micro-Innovation Types

Enterprise innovation awareness mainly indicates the innovation spirit of the management level or entrepreneurs and employees, and also indicates the innovation culture of an enterprise. Joseph

Schumpeter once stressed that the crucial force to innovate is entrepreneurship with the pursuit of interests (Ni et al., 2011). Innovative entrepreneurship has great importance to enterprise innovation (Kim et al., 1993; Zhu et al., 2005; Avlonitis et al., 2007). If an enterprise's management level has no innovative spirit or is not willing to innovate, it will evidently prevent an enterprise from innovation activities. An (2005) points out that weak innovation awareness, especially the lack of entrepreneurs with innovation spirit, is one of the main impediments to SMEs technological innovation. In Lee et al. (2006), it is found that the management style (charm and inspiration) has been closely related to the staff innovation capability, especially the impact of the management innovation on staff innovation capability is larger than the impact of R&D innovation generating new techniques or technologies. On the other hand, innovative culture has an important impact on an enterprise's innovation activities and awareness. Yetim et al. (2006) consider that an entrepreneur develops innovative corporate culture through building innovation network with external links to strengthen the enterprise technological innovation level and management innovation capability. Yetim et al. (2006) point out that entrepreneurs and corporate culture have great importance to enterprise innovation. Enterprise innovation awareness has become a key affecting factor of enterprises. Strong innovation awareness can promote enterprises' innovation activities while the lack of innovation awareness will not facilitate or even prevent innovation activities. When enterprise innovation awareness is weak, enterprises may not realize the importance of innovation and even choose to circumvent innovation because of the risk. An enterprise may choose to introduce micro-innovation to adapt to market demands and advancement and to promote enterprise development. But enterprises may not advance micro-innovation effectively because of weak enterprise innovation awareness. Strong innovation awareness will consolidate the internal innovation atmosphere and make enterprises realize the importance of innovation to its development, which will facilitate enterprise micro-innovation to seek the long-term development. The stronger enterprise innovation awareness, the more favorable it is for the generation and development of independent micro-innovation. Thus Hypothesis 3 is proposed:

H3: Weak enterprise innovation awareness, including the management level and staff's unwillingness to introduce innovation and corporate culture unfavorable for innovation, is not conducive to the advancement and development of corporate micro-innovation.

(4) Correlation between Organizational Setting and Micro-Innovation Types

Corporate organizational structure has an important influence on the implementation of micro-innovation. Corporate organizational setting is to achieve an enterprise's target, and its matching extent with corporate innovation will directly affect the results of corporate innovation (Gao and Yin, 2004). Innovation ideas and thinking need a flexible organizational structure, but the implementation of innovation ideas needs an orderly organizational structure (Kabter, 1988). According to Gao and Yin (2004), successful technological innovation demands an open and flexible organizational structure to ensure the generation of innovative ideas and also demands some stability to ensure that the organization strives for the established target. Organizational setting plays a more and more important role in corporate innovation. Kim et al. (1993) point out that the professional organizational structure is the most distinct factor affecting SMEs innovation. An improper organizational setting can hinder an enterprise's innovation activities to some extent. According to Yao (2006), factors affecting technological innovation mainly include a lack of effective system, backward views and deficiency in technological innovation talents, etc. The organizational setting will affect corporate innovation activities by the intermediate of corporate innovation willingness and the implementation of innovation. When the organizational setting favors innovation, it will consolidate corporate innovation awareness, benefit the implementation of innovation activities, and facilitate the generation and development of corporate micro-innovation. When the organizational setting is unreasonable, it will restrain enterprise innovation awareness and hinder the implementation of corpo-

rate innovation activities. To adapt to market demand changes, an enterprise will also implement micro-innovation even when its organizational structure is unreasonable so as to promote corporate development and enhance competitive strengths. However, an unreasonable organizational structure will prevent micro-innovation. Therefore, Hypothesis 4 is proposed:

H4: An unreasonable organizational setting does not favor the advancement and development of enterprise micro-innovation.

(5) Correlation between Market Demand and Micro-Innovation Types

Market demand is one major impetus of enterprise innovation. Market demand not only can provide innovative thinking and opportunities, but also can become internal impetus for inducing corporate innovation (Chang, 2005). According to Fan (2007), an effective demand scale can reduce R&D risk and improve technological innovation efficiency. In Sun (2009), a demand scale and industry technology innovation have an endogenous relationship. An insufficient effective demand scale and low-end demand structure are the key factors restraining industry innovation capability. When market demand is insufficient, enterprises are not willing to input a great deal of investment resources to make independent innovation for small-scale demand, but may turn to imitating the established mature technology to meet the market demand. Under such circumstances, enterprises may implement imitating micro-innovation; when market demand is sufficient, enterprises choose to make independent innovation to meet large-scale market demand, so as to develop core technology and gain more market share. Thus, Hypothesis 5 is brought forward:

H5: When market demand is insufficient, enterprises tend to choose imitating micro-innovation.

(6) Correlation between Related Laws, Regulations or Standards and Micro-Innovation Types

As far as many Chinese enterprises are concerned, whether related laws favor innovation or not has an important influence on enterprise innovation activities. In Smallbone et al. (2003), the government capital support and related policies have an important impact on enterprise innovation. According to An (2005), an incomplete related legal system is one main impediment to SMEs technology innovation. The research in Li et al. (2008) shows that the government innovation policies play an active role in enterprise innovation performance through increasing enterprise innovation input and strengthening initiatives for innovation activities. As a whole, related laws, regulations or standards mainly influence the selection of enterprise micro-innovation type. Enterprises may choose continuous or imitating micro-innovation to lower risk when laws and regulations or standards are not conducive to innovation. Enterprises receiving the government support have strong innovativeness (Liu Danlu, 2012). Enterprises will take advantage of their strong internal innovativeness and external government support to introduce independent micro-innovation to enhance their competitive strengths when related laws, regulations and standards are favorable for corporate innovation. Hereby Hypothesis 6 is proposed:

H6: Enterprises tend to select continuous or imitating micro-innovation when related laws, regulations or standards do not facilitate innovation.

4. Empirical Research on the Correlation between SMEs Micro-Innovation Types and Affecting Factors

4.1. Sample Selection and Data Collection

Zhejiang is one of the provinces where private economy is developing most vigorously. Since the reform and opening-up in 1978, the fast development of Zhejiang economy has benefited from SMEs innovation and start-up activities. According to Zhejiang's statistical annals in 2013, the number of Zhejiang's industrial enterprises with annual revenue of 20 million yuans or more in 2011 and 2012 was 34,340 and 36,496 respectively, among which the number of large-scale enterprises is 621 and 592 respectively and SMEs account for more than 98%. However, Zhejiang is confronted with the huge pressure of economic transformation under the influence of macro-economic factors like the appreciation of RMB, the rise in prices of raw materials, the adjustment of export tariff

rebates and the rise in labor cost in recent five years. The shift and selection of Zhejiang SMEs innovation and start-up manner have become the key of Zhejiang economic transformation and also an epitome of Chinese SMEs economic transformation. In the path exploration, micro-innovation has become an important selection of Zhejiang SMEs innovation and start-up manner. Representative SMEs in Wenzhou and Yiwu, etc., strive hard to accumulate micro-innovation experience and reshape the fast demand development road. Micro-innovation is not always smooth-going, but is affected by many factors. Therefore, the paper takes Zhejiang SMEs as the research sample and empirically analyzes the correlation between SMEs micro-innovation types and its affecting factors.

The data collection of this research is divided into four stages. Stage 1 is an empirical investigation period funded by the National Natural Science Foundation of China from August to October, 2012. As an exploratory stage, Stage 1 further revised and updated the questionnaire through on-site interviews which adjusted the queries in the questionnaire and added the questions not tapped on. The subject group further revised the questionnaire and adjusted the research proposal through interview investigation in Stage 1. The subject group collected 46 empirical questionnaires through instructional filling-in and all the 46 samples were effective. Stage 2 is an interview and investigation period organized by Zhejiang Province Economic and Information Commission from February to April, 2013. During interviews and investigation, the subject group visited and examined high-tech enterprises in Zhejiang and investigated enterprises that produce ships, fire-fighting equipment, security protection and monitoring systems, etc. A total of 103 enterprises were interviewed and investigated by the subject group, among which 51 enterprises were invited to fill in questionnaires. Stage 3 is an investigation period on the status quo of the innovation alliance of advantageous growing enterprises within the governance of Pingyang County organized by the Pingyang government of Wenzhou city, Zhejiang Province, from March to May, 2013. The science and technology bureau of Pingyang County sent 146 questionnaires by email to advantageous growing enterprises within its governance and collected 79 effective samples. Stage 4 is an empirical research period on MBA students on campus or graduates of Zhejiang colleges and universities which lasted from March to June, 2014. Questionnaires were mainly delivered through MBA centers in each college and university to invite their students and graduates. About 100 persons took part in innovation management activities among nearly 300 MBA learners invited. There were 63 effective samples among the collected 93 questionnaires after evaluation and selection. 388 sample enterprises were investigated during the stated four stages and 239 effective sample questionnaires were collected.

The following methods were further used to sift and process questionnaires to ensure the science and accuracy of collected information and to reduce the error of questionnaire information. (1) Inviting experts and experienced corporate managing leaders to evaluate and analyze, and then eliminate some samples with notable errors; (2) subjectively evaluating collected data by government supervision departments (e.g. Zhejiang Province Economy and Information Commission, Zhejiang Province Science and Technology Department) and industry alliance to revise and eliminate some distortional samples. **210 effective questionnaires were collected after data sift and processing.**

4.2. Empirical Research on the Correlation between SMEs Micro-Innovation Types and Affecting Factors

4.2.1. Factor Analysis of SMEs Micro-Innovation Types

SPSS 18.0 is adopted to analyze micro-innovation affecting factors and different micro-innovation types. In order to identify micro-innovation types, Principal Components Analysis (PCA) is employed to conduct factor analysis of the variances of 9 micro-innovation types, and 3 factors are extracted. The KMO (Kaiser-Meyer-Olkin) value of micro-innovation types variance is 0.766 indicating the variance suitable for factor analysis. Factors are extracted through maximum variance algorithm during factor analysis, and the total explained variance of three extracted factors is 73.68%. Based on the analysis, the three extracted factors are in line with the expla-

Table 1 Factor Analysis of Micro-Innovation Types

	Factor Loading		
	Independent Micro-innovation	**Imitating Micro-innovation**	**Continuous Micro-innovation**
Internal R&D Innovation	**.719**	.294	.007
Industry Alliance Innovation	**.865**	.259	.028
Technology Outsourced Innovation	**.875**	.157	.066
Supplier Pushed Innovation	.176	**.869**	.119
Leading User Boosted Innovation	.224	**.773**	.106
Promotion Learning Innovation	.346	**.784**	.104
Policy Induced Innovation	.095	–.012	**.838**
Technology Substitution Innovation	.086	.150	**.831**
Market Linked Innovation	–.088	.168	**.863**

nation of independent micro-innovation, imitating micro-innovation and continuous micro-innovation. Therefore, these three micro-innovation types can be used to define the extracted factors. For details, please see Table 1.

The values of Cronbach's α of the above three micro-innovation types are 0.827, 0.818 and 0.809 respectively, larger than 0.7, and the correlation coefficient between each question choices and the total variance is larger than 0.35. Therefore, the reliability of factor extraction is good enough to pass the reliability check.

4.2.2. Correlation Analysis between Enterprise Micro-Innovation Types and Affecting Factors

SPSS 18.0 is employed to make a correlation analysis between micro-innovation types and affecting factors with distinct levels under 0.01 and 0.05. For the results, please see Table 2.

The empirical analysis showcases that different affecting factors have a different impact on micro-innovation types. Generally speaking, each affecting factor has an explicit impact on imitating micro-innovation and less impact on independent micro-

Table 2. Correlation Analysis between Chinese Enterprise Micro-Innovation Types and Affecting Factors

	Independent Micro-innovation	**Imitating Micro-innovation**	**Continuous Micro-innovation**
Insufficient market demand	.145	**.266****	.039
Innovation risk	**.193***	**.368****	**.154***
Deficient innovation capital	.118	.161	.065
Lack of professional technology talents	.044	**.177***	–.074
Unreasonable organizational setting	.154	.100	–.061
Leaders or employees unwilling to innovate	.100	.111	–.004
Corporate culture unfavorable for innovation	.023	.062	–.113
Laws, regulations or standards unfavorable for innovation	**.227****	**.428****	**.287****

* Significance of correlation at 0.05 of probability (two-sided).
** Significance of correlation at 0.01 of probability (two-sided).

innovation and continuous micro-innovation, which tallies with Chinese SMEs traits and market characteristics. The input of micro-innovation is relatively small, though Chinese SMEs still lack enough innovation impetus. Especially the probability of implementing independent micro-innovation is small. More SMEs tend to choose imitating micro-innovation through studying competitors, especially the products of world's leading vendors. Imitated micro-innovated products are accepted by the market due to the high price-performance ratio. Table 2 proves that the correlation between affecting factors and micro-innovation types is as follows:

(1) The lack of innovation capital is not relevant to three types of micro-innovation, proving that low innovation input is still a main impediment to SMEs micro-innovation. The significance of correlation between the lack of professional technology talents and imitating micro-innovation is at 0.05 of probability, while the lack of professional technology talents is not relevant to independent and continuous micro-innovation, indicating that micro-innovation does not highlight technological breakthrough but has a high standard for talents. Imitating micro-innovation is an adaption of the established mature technology in the market, has low requirements for professional talents and puts an emphasis on technological application. SMEs are inclined to implement imitating micro-innovation when they lack professional technology talents. Hypothesis 1 is validated partly.

(2) Innovation risk is relevant to all of the three types of micro-innovation. The results testify that innovation risk does not become an impediment to each micro-innovation though much attention has been paid to innovation risk during the SMEs innovating process. Hypothesis 2 is attested partially.

(3) Leaders or employees unwilling to introduce innovation and corporate culture unfavorable for innovation are irrelevant to different micro-innovation, which explains weak SMEs internal innovation awareness unfavorable for the advancement and development of each micro-innovation. Enterprises should strengthen their internal innovation awareness to promote innovation thinking. Hypothesis 3 is proved.

(4) An unreasonable corporate organizational setting is irrelevant to different micro-innovation of sample enterprises, indicating that an unreasonable organizational setting will obstruct SMEs micro-innovation. Enterprises should set up a favorable innovation organizational setting to facilitate the effective implementation of innovation activities. Hypothesis 4 is confirmed.

(5) The significance of correlation between insufficient market demand and imitating micro-innovation is at 0.01 probability, while it is irrelevant to independent and continuous micro-innovation. This shows that insufficient market demand is an evident impediment to independent and continuous micro-innovation and will facilitate imitating micro-innovation. It is well noted that enterprises still choose imitating micro-innovation when market demand is insufficient. This proves that Chinese SMEs mainly hope to develop the market by learning or referring to leading vendors and competitors. Hypothesis 5 is proved.

(6) The values of correlation coefficients between government laws, regulations or standards unfavorable for innovation and independent, imitating and continuous micro-innovation are 0.227, 0.428 and 0.330 respectively. Their corresponding P value is less than 0.01. It shows that government laws, regulations or standards unfavorable for innovation are not a notable obstruction to each micro-innovation. Against the background of the current market and policy system, SMEs usually break policy and regulation limitations to implement micro-innovation to win market recognition and competitive strengths, which showcases the full vitality of Chinese SMEs in transformation. Hypothesis 6 is partially proved.

4.3. Discussion and Analysis of Empirical Results

Based on the above empirical analysis results, different affecting factors impact enterprise micro-innovation in different

manners and to a different extent. Therefore, enterprises should choose an appropriate micro-innovation type or different micro-innovation type combinations based on a comprehensive analysis of enterprise internal productive resources, management resources and external restrictions.

(1) SMEs should choose effective micro-innovation types based on different innovation resource elements. Enterprises can choose independent innovation when the internal innovation resource element is sufficient to strengthen their advantageous position; enterprises can choose imitating micro-innovation according to the established technology when there is no sufficient strength to implement independent innovation, especially when they lack professional technology talents.

(2) Enterprises should develop innovative entrepreneurship, develop favorable corporate culture for innovation and set up reasonable organizational structure to advance micro-innovation. If managing leaders have no innovative spirits, it is unfavorable for the generation of micro-innovation and development of innovative corporate culture. Enterprises without innovation culture or with a weak innovation culture do not foster the implementation of micro-innovation activities and even refrain from the development of micro-innovation. An unreasonable corporate organizational setting goes against the implementation and realization of micro-innovation. Therefore, it would not help advance the development of any micro-innovation when any of the above elements is insufficient.

(3) SMEs should determine appropriate micro-innovation types based on different external restrictions. Enterprises can choose to introduce independent and continuous micro-innovation when external conditions are favorable such as insufficient market demand. Enterprises can implement imitating micro-innovation to circumvent external restrictions and give full play to enterprise strengths when enterprises are restricted by external conditions such as high innovation risk and insufficient market demand.

5. Conclusions

Innovation is an important path to advance an enterprise's transformational upgrade, while micro-innovation provides SMEs with new developing ideas and opportunities when there is no sufficient strength to undertake large-scale R&D activities. The definitions of micro-innovation are not confined to tiny technological innovation. Micro-innovation indicates a kind of innovative thinking (Saariluoma et al., 2009). Micro-innovation is a kind of innovative manner and a living strategy for many enterprises. This paper, based on the analysis of micro-innovation definitions, summarizes its traits including all-round openness, broad penetration, duality and fast iteration. Micro-innovation is divided into three types – imitating, continuous and independent micro-innovation – based on innovativeness, market disruption and repetitiveness in the innovation domain. Finally, empirical research on the correlation between micro-innovation types and affecting factors is conducted. Empirical results show that different affecting factors impact the various micro-innovation types in a different manner and to a different extent. Each affecting factor has a remarkable impact on imitating micro-innovation, but has less impact on independent and continuous micro-innovation. Enterprises should choose an appropriate micro-innovation type or type combinations of different micro-innovation after comprehensively considering enterprise internal productive resources, management resources and external restrictions.

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