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Preface

Innovation is widely recognized as the driving force for economic development and a major source of modern productivity growth. The issue of innovation capability building in Chinese small- and medium-sized enterprises (SMEs), for all the times, has been under observation by entrepreneurs, scholars and governments.

In the early 1990s, the International Development Research Center of Canada (IDRC) began to support research projects on indigenous innovation. At that time, indigenous innovation was still an un-discovered idea in Chinese manufacturing. IDRC supported our Research Center for Innovation and Development (RCID) at Zhejiang University in the project "Sustainability and Indigenous Innovation: SMEs in China", which was our first step towards research on indigenous innovation in the context of small- and medium-sized enterprises.

In 2007, hosted by Dr. Ellie Osir, senior officer of IDRC (Singapore Branch), IDRC supported our research once again. The project was "Application of Total Innovation Management (TIM) to Leverage Innovation Capability in Chinese SMEs", which aimed to investigate ways to leverage innovative capabilities and competitiveness of SMEs via TIM. It was expected to increase the capability for employment within SMEs, and thereby contribute to poverty and unemployment reduction and social wealth creation.

After two and a half years of investigation and study, the project examined the current status of SMEs in Zhejiang and other Chinese provinces, and assessed the applicability of the TIM theory and practice in SMEs. The research output led to some policy recommendations to the provincial government, other local authorities, and the central government. Apart from enhancing indigenous innovation capabilities of SMEs, the project advanced existing knowledge on innovation management, technology management and innovation policy within the SMEs.

As one of the outputs of the IDRC project, we hope this book can be helpful in both theory development and industrial practice on innovation for entrepreneurs, scholars and governments. There are two main parts in this book, including a theoretical research part and a case study part. Professors, research assistants and staff who contributed to the research, compilation and editing of this book include Academician Xu Qingrui (Zhejiang University), Professor Chen Jin (Zhejiang University), Professor Guo Bin (Zhejiang University), Professor Zhu Bin (Fuzhou University), Associate Professor Shou Yongyi (Zhejiang University), Associate Professor Zhao Xiaoqing (Zhejiang University), Associate Professor Zheng Gang (Zhejiang University), Associate Researcher Liu Jingjiang (Zhejiang University), Assistant Professor Lin Xin (Fuzhou University) and Ms. Wang Lihua (Zhejiang University). Some Ph.D. candidates and M.S. candidates of Zhejiang University also took part in the research, compilation and editing of this book as research assistants, including Zhang Jun (Ph.D. candidate, associate professor of Anhui University of Technology), Ren Zongqiang (Ph.D. candidate, senior engineer), Li Wangfang (Ph.D. candidate), Chen Litian (Ph.D. candidate), Zhang Suping (Ph.D. candidate), Li Qiang (Ph.D. candidate) of Zhejiang University City College, Chen Feng (M.S. candidate), Jin Lu (M.S. candidate), Mei Liang (M.S. candidate), Wu Lubin (M.S. candidate) and Sun Yu (M.S. candidate).

During the research and investigation period, we obtained great help from many government departments, as well as several colleges and universities. We would like to especially appreciate the help of Mr. Jiang Taiwei (Head, Science and Technology Department of

Zhejiang Province), Mr. Tang Lilu and Mr. Li Jingning (Zhejiang Economic and Information Technology Commission), Mr. Cai Zhangsheng (Zhejiang SME Administration Bureau), Professor Chi Renyong (Zhejiang University of Technology), Professor Si Chunlin (Fudan University), and Associate Professor Richard Smith (Simon Fraser University, Canada), etc.

We thank readers for your concern and support of this new book, and we look forward to your valuable comments and suggestions.

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Weihai City, Shandong Province
August 2010

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Part 1 Theoretical Research on Innovation

Chapter

1

Development via Innovative Firms

In most cases, enterprises do not have sufficient resources to implement a great amount of innovative activities because it is usually constrained by its capital and scale in the very beginning. Therefore, an enterprise usually focuses on improvements from particular perspectives. The question "How to become an innovative firm?" becomes a very tough problem. This book attempts to summarize a general innovative path seen from several innovative firms, and search for key innovation elements in different innovation stages by analyzing the innovation status and innovation path of some innovative firms.

It is the paramount task of the Chinese Government to achieve sustained economic growth as well as social progress and improved the quality of the people's life. All of these are achieved by both incremental institutional reforms and radical science advancement and fast technological innovation.

Indigenous innovation in China has played an underpinning role in China's science & technology (S&T) progress and social development. As a result, China is becoming the potential S&T superpower in the world. R&D expenditure over GDP is 1.54% at year of 2008 and it is expected to reach 2.5% by year of 2020. Indexed science papers and patents applied by China will continue to increase. China is

also one of the countries to realize the importance of technological innovation, and is trying to commercialize R&D and improve links between R&D supply and economic demand. As Gary Hamel said, "There are no strategies for creating wealth in the long-term that are not driven by innovation." The thought of economist Schumpeter is widely accepted by the Chinese Government and enterprises. According to China's 15 Year Medium to Long Term S&T Plan, China is actively trying to be one of the innovative countries in the world.

With a population of 1.3 billion, a vast and varied territory and a rapidly changing development landscape, China is a challenging nation in terms of sustained economic growth and social welfare. It is innovation instead of cheap labor and capital that should drive China's sustainable development. The main body of innovation is the firm. Thus, the innovative firms in China, both large enterprises and SMEs, have been playing and will play an important role in reaching the development goals of China.

1.1 WHAT IS AN INNOVATIVE FIRM?

The concept of innovative firm has been defined by scholars from different perspectives. Usually the concepts are proposed from aspects of the main body, the content, the output and the capabilities of innovation.

According to Cheng Siwei and Feng Haiyu's definition, an innovative firm is an enterprise which is centered on technology innovation, premised by a complete innovation system, and guaranteed by management innovation. Cheng emphasized the dominance of technology innovation, as well as the synergy between technological and organizational factors (Cheng, 2005).

According to the Oslo Manual, "the TPP (technological product and process) innovating firm is one that has implemented technologically new or significantly improved products or processes or combinations of products and processes during the period under review" (OECD, 2005). So, an innovative firm is defined as the enterprise with sustained high innovation performance. Innovation is the driver of an enterprise's development.

According to Manchester Business School, an innovative firm is defined as the enterprise that outperforms its industry rivals by maintaining innovation capability, such as technological capability, marketing capability as well as management capability. The comprehensiveness of innovation is emphasized (Manchester Business School, 2006). There are many dimensions in innovation practices, such as technology innovation, market innovation and management innovation.

In the document introduced by the Chinese Ministry of Science and Technology (MOST), the State Assets Supervision and Administration Commission (SASAC), and Federation of Trade Unions (FTU) in 2008, the innovative firm is defined as the enterprise with high performance of technology innovation, brand innovation, system and institution innovation, and culture innovation, etc. (MOST, SASAC, FTU, 2008). The comprehensiveness of innovation is highlighted. There are many dimensions in innovation practices, such as technology innovation, market innovation, institution innovation, and culture innovation, etc.

The discussion on the connotation of innovative firm is briefly concluded in Table 1.1.

Based on the review of literature and our group's 20 years of study, the innovative firm can be defined as one that views innovation as a core value. A complete innovation system and competitive products (including services) is the key to becoming an innovative firm.

The essence of an innovative firm is a complete innovation system within the enterprise, which can provide sustainable motivation and capabilities for the enterprise. The external representation of an innovative firm lies in its innovative products, services and operations model, which generate competitive advantage for the firm.

1.2 THE CHARACTERISTICS OF AN INNOVATIVE FIRM

In this section, viewpoints about the characteristics of an innovative firm in China are compared.

Ten characteristics have been proposed by Freeman to describe an innovative firm, such as high R&D intensity, focusing on basic

Table 1.1. Connotation of Innovative Firm

Main idea	Features	Typical scholars/ Institutes
• Centered by technology innovation • Premised by completed innovation system • Guaranteed by management innovation	• The dominance of technology innovation • The synergy between technological factor and organizational factor	Cheng (2005) Feng (2007)
• Sustained high innovation performance • Outperforms its industry rivals • Maintaining technological capability, marketing capability and management capability	• Innovation as the driver of enterprise's development • The comprehensiveness of innovation (technology, marketing, management)	OECD (2005) Manchester Business School (2006)
• High performance • Technology innovation, brand innovation, institution innovation, culture innovation	• The comprehensiveness of innovation (technology, brand, institution, culture)	MOST, SASAC, FTU (2008)

Sources: 1. Chinese Ministry of Science and Technology, the State Assets Supervision and Administration Commission, Federation of Trade Unions (2008). Working Meeting for Building Innovative Firms, Beijing (in Chinese). 2. Cheng, S. (2005), Enterprise is the Main Body of Innovative Country. http://www.cqvip.com/QK/90470X/2006007/22292586.html (in Chinese). 3. European Commission (2009), European Innovation Scoreboard 2008 — Comparative Analysis of Innovation Performance. http://ec.europa.eu/education/lifelonglearningpolicy/doc/creativity/report/measure.pdf. 4. Feng, H. and Huang, D. (2005), A Research on the Essence of Innovative Firm. *Science and Technology Management Research*, 4 (in Chinese). http://www.nova.edu/ssss/QR/QR3-3/tellis2.htmlS (accessed 15.12.05).

research, filing patent, large enough enterprise scale to cover R&D expense, shorter development cycle, risk-taking, etc. (Freeman, 1982). He emphasized on technology, marketing and entrepreneurship. However, many Chinese SMEs which play an important role on innovation in China, would not be considered as innovative firms according to Freeman's definition.

Seven characteristics have been proposed by Tidd to describe an innovative firm, such as shared vision, leadership and the will to innovate, appropriate organizational structure, key individuals, high involvement in innovation, effective team working, creative climate, boundary spanning and beyond the steady state (Tidd, 2007). According to his opinion, internal and external organizational learning and culture is emphasized. The purpose of innovation is to create value for customers. But here, the market-oriented factors are neglected.

According to the European Commission, an innovative firm is characterized by two types of skills: strategic skills and organizational skills. They highlight the guiding position of strategy innovation and the importance of organizational fit. However, there is no detailed description about the content of strategic or organizational skills in the statement.

Liu Ji, the vice chairman of Chinese Academy of Social Science, said, "The essence of an innovative firm is a complete innovation system, which enables it to innovate continuously and make contribution to the society." (Liu, 2007). He emphasized on the sustainability and comprehensiveness of innovation as well as the social responsibility that innovative firms must take. Facing globalization, technology seeking becomes a common problem in many innovative firms. This viewpoint only pays attention to the indigenous sources of technology innovation.

The characteristics of an innovative firm and the classification of viewpoints towards the essence of an innovative firm are as shown in Tables 1.2 and 1.3 respectively.

Based on the studies, four core features of an innovative firm have been summarized: indigenous innovation, sustainable and dynamic innovation, comprehensiveness of innovation and high innovation performance.

- **Indigenous innovation:** An enterprise should consist of innovating mainly by itself. As the core value of the enterprise, indigenous innovation is the most important point of all activities within the enterprise. Top managers need to realize that innovation is the basis for the enterprise's further development, because it provides good chances for the enterprise to become a new body

Table 1.2. Characteristics of an Innovative Firm

Typical scholars/ Institutes	The characteristics of an innovative firm	Key point emphasized	Discussion on the shortage of the view point
Freeman (1982)	High R&D intensity, focusing on basic research, filing patent, large enough enterprise scale to cover R&D expense, shorter development cycle, risk-taking, etc	Technology, marketing and entrepreneurship	Many Chinese SMEs, which play an important role on innovation in China, would not be considered as innovative firms if according to Freeman's definition
Tidd (2007)	Shared vision, leadership and the will to innovate, appropriate organizational structure, key individuals, high involvement in innovation, effective team working, creative climate, boundary spanning and beyond the steady state	Internal and external organizational learning and culture	The market-oriented factors are neglected
European Commission (2009)	Strategic skills and organizational skills	• The guiding position of strategy innovation • The importance of organizational fit	There is no detailed description about the content of strategic and organizational skills

(*Continued*)

Table 1.2. (*Continued*)

Typical scholars/ Institutes	The characteristics of an innovative firm	Key point emphasized	Discussion on the shortage of the view point
Liu (2007)	A complete innovation system	• The sustainability and comprehensiveness of innovation • The social responsibility that innovative firm must take	Only emphasis on the endogenous sources of technology innovation
MOST, SASAC, FTU (2008)	Core technology with intellectual property, continuous innovation capability, high performance, innovative culture and strategy	The comprehensiveness and sustainability of innovation	Ignored the allocation of resource, which supports the interaction of technological factors and market factors

Sources: 1. Chinese Ministry of Science and Technology, The State Assets Supervision and Administration Commission, Federation of Trade Unions (2008), Working Meeting for Building Innovative Firms, Beijing (in Chinese). 2. European Commission (2009), European Innovation Scoreboard 2008 — Comparative Analysis of Innovation Performance. 3. Freeman, C. (1982), *Economics of Industrial Innovation*. The MIT Press. 4. Liu, J. (2007), A Research on Innovative Firm. *China Soft Science*, 2 (in Chinese). 5. Tidd, J. (1999), *Managing Innovation: Integrating Technological, Market and Organizational Changes*, 3rd Edition. Elsevier, 61–74.