

Audit the Technological Innovation of the Innovative Enterprise

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Abstract: The conception of innovative enterprises and their innovation activities natures are analyzed in this article. Based on the study of innovation audit, and using Finance, Auditing, statistics and other multi-disciplinary knowledge, an audit framework is constructed including diversified audit body, audit model for innovation activities, specific audit contents and standards of each audit element, which is of great significance to execute innovation audit for innovative enterprises.

Keywords: innovative enterprises, technological innovation, audit content

1. Introduction

In order to enhance the ability of independent innovation and carry out the strategy of the innovation-oriented country, China's central and local governments launched a pilot project of establishing innovative enterprises with relevant policies on finance, taxation and intellectual property rights being formulated. Moreover a large amount of private and venture capital has been accumulated in those innovative enterprises. It has become necessary to evaluate the performance of innovative enterprises objectively and correctly. Innovation audit is an effective method of evaluation and a reasonable innovation audit model is the basis for audit. Based on the study of the extensive literatures on innovation audit and combined with the innovation features of the innovative enterprises, an audit model was constructed, which can provide the way for government, public, enterprise managers and other interest groups to analyses and evaluate the activities in innovative enterprises.

2. The conception and innovative features of the innovative enterprises

Innovative enterprises generated in the post-industrial economy era and rose with the booming of knowledge economy and IT industry. It increasingly shows its advance, demonstration and high-growth nature and definitely will become the mainstream model of new economy. So what are innovative enterprises? And what are they different from activities of general business innovation?

2.1 The conception of innovative enterprises

Many scholars have defined the innovative enterprise. Jiang Yongfei, Cai Qixiang and others argued that the enterprises engaged in technical innovation with high effective performance are innovative enterprises^{[1][2]}. Chen Yongxing and Feng Haihao think that the innovative enterprises are those new enterprises guided by innovative ideas, based on innovation system, intellectual property rights and brand as core technology, which take the comprehensive and continuous independent innovation as a means to obtaining more profits and sustainable development^{[3][4]}. This article analyses these enterprises' innovative features, and constructs audit model fitted for their innovative features. Hence we follow the definition defined by the Ministry of Science and Technology, the State-owned Assets Management Committee, National Trade Unions in April 2006, that is, the enterprises are those prominent on technological innovation, brand innovation, system and mechanism innovation, management innovation, ideas and culture innovation as well as with independent intellectual property rights as core technology, continuing innovation capacity, industrial driver and independent brands, having strong profitability and higher management level of innovation and innovative strategy and culture.

2.2 innovation features of innovative enterprises

Chinese scholars such as Jiang Yongfei, Zhang Jinshui and Yu Lei argue that independence, importance, advance, high profitability and system are the vital features of innovative actions of an innovative enterprise. In addition, we think that there is another important feature of

innovation activities of the China's innovative pilot enterprises, namely the innovation numbers' externality and diversification. There are lots of reasons. For example, R&D fees account for 6% of sales in 287 Chinese Innovative pilot enterprises. Plus subsequent investments, the amount of investment will be so great that it can not be born by the individual firm. Multi-channel financing bring a wide range of investors. Furthermore, innovation activities of innovative enterprises have the natures of advance and complexity, which makes individual enterprise be hard to complete all the innovative activities. Only a number of joint enterprises with different core capabilities can complete it. All of these features require innovative management model.

3. Review innovation Audit

Innovation audit is based on the measurement of innovation system. By the method, auditors can find out the gap between current practice and expected standard and identify problems and process needed to be improved, then they provide the information for the managers to improve innovation management and innovation performance.

Innovation audit draws more attention as auditors can evaluate firm innovation capability and performance comprehensively and profoundly. The study of innovation audit began with the audit questionnaires designed by Jackson Martindell (1962), William P-Leonard (1962) and Wgiam Greenwood (1967), which became the basis of designing innovation audit survey. The audit model based on innovation process developed by Chiesa^[5], and the model based on innovation capability made by Burgel-man^[6]. As well as the model based on innovation strategy put forward by Adler have become the classical theories of innovation audit^[7]. Meanwhile combined these models with China's reality, home scholars put forward some audit models which are fitted for innovation features of Chinese enterprises. combining Chiesa process audit model with Chinese practice, Chen Jin put forward the C-S audit model^[8]. While Guan Jiancheng constructed the innovation capability audit framework based on Burgel-man's capability audit model^[9]. However, these audit models mainly base on firm technical innovation without accounting for the external

factors such as technology policy, external cooperation. Therefore these audit models are not suitable for the innovative enterprises. It is necessary to construct a new audit model according to the innovation features of the innovative enterprises in China.

4. Constructing innovation audit model

According to the features of the innovative enterprises, on the basis of previous literature, this article constructs innovation audit models including innovation audit team, audit standards and contents.

4.1 Diversified, open and dynamic audit team

Due to diversification, complexity and externality of innovation, it is necessary to organize innovation audit team whose members should be diversified, dynamic and open. Some members are the representatives from internal relevant functional departments, the others are external professional audit staff submitted by government and other investors. These members enter or leave this team according to the audit contents and stage. The division and cooperation among them are also dynamic, which makes sure to optimize cooperation in the need of audit work. Such a dynamic and open audit team needs a strong leader with excellent control and communication ability.

4.2 Innovation audit framework

Innovation performance is the core of innovation management. Innovation capability and process are foundation of innovation performance. Basing on Chiesa's innovation process audit model and Guan Jiancheng's innovation capability audit model, This article constructs an audit framework suitable for the innovative enterprise's innovation capacity, innovation process and innovation performance (figure1). The framework addresses on: 1) the system of innovation process. Technological innovation process is the core of firm innovation, it also interacts with other factors. 2) Comprehensiveness of audit contents. The innovation activities of an innovative enterprise are comprehensive. Not only can it affect the development of an enterprise, but also drive the development of industry and society. 3) Practicable. The model based on the relationship of a variety of innovation activities are conducive to the work of audit. The process of technology innovation includes

Projecting, implementing and evaluating. Accordingly our audit process is also divided into innovation project-

ing audit, innovation process audit and innovation performance audit.

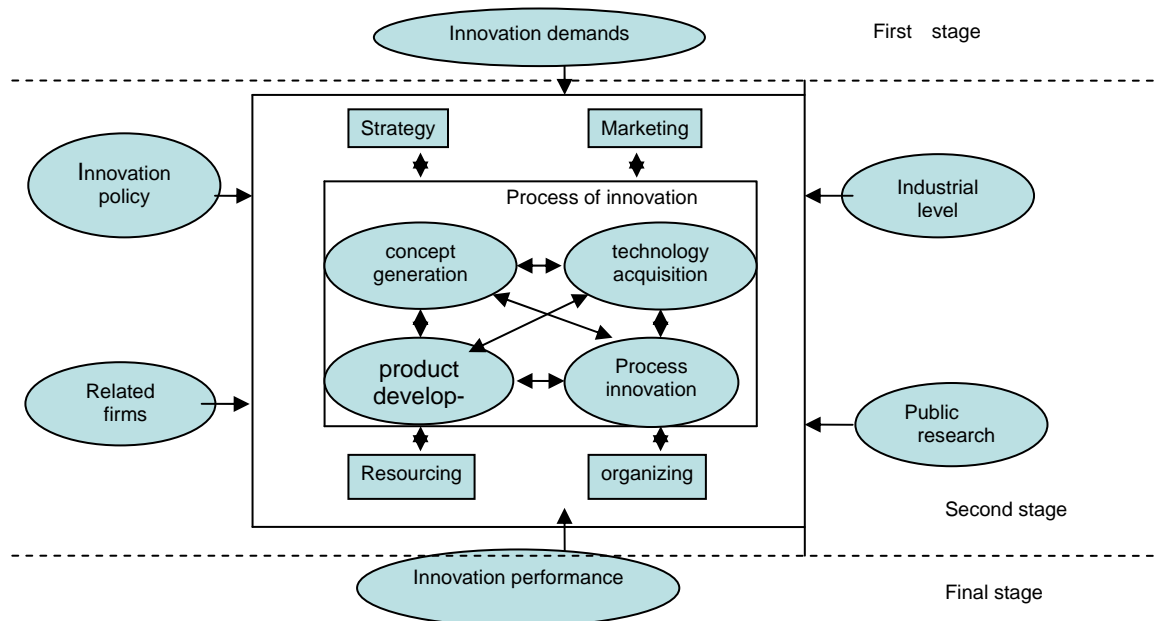


Figure 1 . The mode of innovation audit

The first stage of innovation audit mainly analyses and evaluates the demand of firm innovation, namely the elements driving enterprise to implement innovation. There are various elements leading to innovation. It may be cost, market, competitors or other factors. The demand of Innovation has significant influence on innovation strategy plan and implementation path. So audit staff should understand the main driving factors of innovation.

Innovation capability refers to the capability of implementing and maintaining innovation strategy. It includes the capability of inputting and transferring innovation. This model follows Burgelman's innovation capability model. It mainly audits the enterprise's resource acquisition, Integration capacity, competitor's innovation strategy, industry development, organization and culture and strategy management capacity.

Innovation implementation audit mainly analyses and evaluates innovation process. Innovation process of the innovative firm is the system including core process, support process and external factors. Core process comprises concept generation, product development, process innovation and technology acquisition. Support process includes innovation strategy, marketing, resourcing and organization management. External elements include

external environmental factors affecting innovation such as innovation policies of local government, education and public R&D system and the level of other companies innovation.

Innovation performance is the aim of innovation management and output of innovation actions. Innovation performance includes firm performance and social performance. Firm performance refers to improving the capability of competitiveness. Social performance refers to the impact of innovation on society.

4.3 Identifying specific contents of audit

After constructing of the model, we will identify sub-element for each audit element according to literature review. Of course, a lot of literatures are not consistent, we adopted the elements acknowledged commonly as audit contents.

4.3.1 Audit contents of innovation demand

The audit objective of innovation demand is that identifies the type of driver. By the contacting high managers, the audit staff understand the driving force of innovation, the innovation purpose and the urgency of innovation demand.

4.3.2 Audit contents of core process of innovation

There are not many differences between the core

process of innovative enterprises and that of normal enterprises. Basing on Chiesa's framework of innovation

audit and Oslo manual, we identify the audit contents.(Table 1)

Table 1, audit contents of core process of technological innovation

Process elements	Audit contents	Process elements	Audit contents
Concept process		innovation process:	
Creating new product concept	Systematically monitoring market need Customer relationship Other department participation Link to operation plan	Formulating process innovation strategy	Evaluating the capabilities of existing production processes Establishing a formal procedure for generating a manufacturing strategy Matching process capability to the requirements of the marketplace Linking process innovation and product innovation Allocating resources for developing new process technologies. Monitoring sources of process innovations Matching technology complexity to the capability
product innovation plan	Market-oriented process Prioritizing product development projects Procedure for selecting concept		Managing suppliers Accompanying production process innovations with the appropriate changes in the organization Modifying performance measures Identifying opportunities for improvement in processes
innovativeness and creativity	The incentive policy of Innovation Distribution channel of new ideas Innovative organizational structure Innovation manager	Implementation of new processes	Integrating process improvement and quality control Benchmarking production process performance Involvement of developers Systematically monitoring trends in existing and future technologies Assessing competitors technological capabilities
exploiting innovation	Evaluating opportunities of developing new business opportunities Evaluating risk of new business Assessing the relation of firm innovation and core competencies Using governmental funding mechanisms Integration of functional departments Involvement of other departments Communication among teams Degree of parallelism and integration of task Importance and priority of project evaluation Use of cross-functional teams	Continuous improvement	Identifying emerging technology Understanding core technologies and competencies of the firm Building the required core competencies based on the technological capabilities Relating technology to business objectives and strategies Choosing sources of technologies Evaluating R&D projects Corporate procedure for selecting R&D projects Choosing a portfolio Identify key issues Communication Associate R&D with other firms Optimize resource
product process		Technology acquisition process	
product development process	Defining the states of project managers in the organization organizational integration mechanisms at the initial stages Use of design consultancy team Linking manufacturing and technology Cope with engineering changes Rapid feedback	Formulating technology strategy	
Team and organization		Select and develop technology	Protecting intellectual property Exploiting intellectual property
		management of intellectual property	
Transfer to manufacturing			

4.3.3 Audit contents of innovation support process

The audit of support process mainly includes innovative management such as the strategic plan, marketing, resource distribution and organizational management. For the strategic plan, the auditors had better understand the relationship between innovation strategy and company's overall strategy, how to compare with competitors and study from competitors, technology development path and its influence on innovation strategy and where an enterprise embodies its competitiveness. Marketing audit mainly includes understanding enterprises' strategic plan of new products or service introduced to market, the number and quality of salesman, the relevance of new products and old products, the budget of sales fees, market monitoring measures, after-sales service and so on. Resources distribution audit includes analysis of funding, personnel and equipment. The auditors mainly analyses the raising capital plan and the stable and flexible capital supply plan. They understand the admeasure of human resource for innovation by auditing the plan and management of innovative human. The auditors understand organizational management by the evaluation of the firm organizational flexibility, the ability to adapting and responding to the external environment, organizational innovation culture, the communication between various departments, the ways of dynamic management of various departments involving in the whole process of innovation, the effectiveness of external relation management and so on.

4.3.4 Audit external elements affecting innovation

There are lots of external elements affecting innovation. Of which the most important and direct elements are governmental innovation policy, other enterprises' innovation strategy and innovation level as well as education and public research systems. We can evaluate external policy through understanding the patent protection policy, financial policy, tax policy and so on. Other enterprises' innovation strategy and innovation level affects the company's cooperation and innovation force. Therefore, audit staff should understand the innovation strategy and level of the existing and potential partners competitors. The auditing content of education and public R&D system includes the R&D situation of the universities and non-profit research institutions.

4.3.5 Audit contents of innovation performance

Innovation performance includes the corporate performance and social performance. We Can measure them by some qualitative and quantitative indicators. On the basis of the review on the innovative performance evaluation, we design the indicator system for measuring innovation performance. According with the nature of the innovative firms. Firm innovation performance can measure by innovation rate, sales growth and product competitiveness. Social performance indicators includes Social contribution rate, Social accumulation rate, promoting employment rate, improving the environment, Resource conservation rate and the roles of drawing the industry development.

4.4 Innovation scorecards

Innovation scorecards provide a rapid overall assessment of the practices adopted with the best practice and whether or not the required innovation processes are in place. The basis of the scorecard approach is a description of the characteristics of good practice and poor practice. This description can be translated into the scales against which companies can review themselves.

We carried out an extensive literature review to identify the natures of good and poor practice. In order to describe the natures of the best practice, we examined many writing in the area. Then we took the most experts statement as indicators of the natures of good practice.

In order to use these indicators to assess the innovative actions, auditors can rank the indicators on kinds of scale such as 4-point: 1 being unsatisfactory, 4 being good. By the ways the auditors can find the gap between the current and good practice. This gap may be represented with the diagram. The resulting profile can reflect that a company may have islands of good practice and process that unless fully deployed across the company, may not be fully effective.

The scorecard approach can provide auditors with an overview of the strengths and weaknesses of a company innovation. It can help them identify the area improved.

5. Conclusion

In order to evaluate and improve innovation activities of innovative enterprises objectively and impartially, we must thoroughly inspect the natures of innovation activities. Audit is an ideal method of measuring innovation activities. Basing on the study of related domestic

and international literature. The article constructs the audit model according with innovation features of innovative firms, which provide a fundamental framework for auditing the innovation of the innovative firms. However, This article is only a basic framework for audit. The auditors should refine and adjust the model by the specific innovative actions.

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