Enterprise Technological Innovation: Motivation Sources and Integrated Model of Motivation Factors

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Abstract The purpose of this paper is to study the motivation of enterprise technological innovation. This paper analyzes the motivation sources of enterprise technological innovation, and defines five types of sources: technological driving, demands pulling, market competition driving, entrepreneur preference driving and government behavior driving. Motivation factors are classified into three aspects, which are enterprise resource system, society external environment system and market competition system. The integrated model of motivation factors is established. In spite that the benefit expectation factor is taken as the primary factor of technological innovation motivation, this model includes some secondary factors, such as enterprise resource, competitors and entrepreneur’s innovation thinking.

Key words technological innovation, motivation source, integrated model

1 Introduction

In this epoch of knowledge economy, the competition among enterprises depends on science and technology more and more. There is a new trend of technological innovation in enterprise management nowadays. An enterprise needs certain key elements to implement technological innovation, and faces risk in the innovation, such as the uncertainty of success of technological innovation and the uncertainty of expected profit to be gained after success. These key factors and different kinds of risk would determine whether an enterprise has enough motivation to carry on the technological innovation. The power of technological innovation for an enterprise is a sum of motivation factors, which exist inside the enterprise’s technological innovation system and have inner driving power on the activities of innovation. The motivation comes from the internal demands of an enterprise, for self-developing, participating in market competition and pursuing profit maximization. In a word, an enterprise may gain economy advantages and relative competitive superiority while it meets the requirements of self-development and society demands through technological innovation. This is the inner motivation and the primary reason of technological innovation for an enterprise[1].

Since the end of the 1980s, Chinese scholars have made extensive studies on different issues about technological innovation, such as its operation mechanism, its incentive motivation mechanism, its venture share mechanism, its information feedback mechanism, technological innovation capability of enterprises, technological innovation management, and relevant policy environment. When these studies provide useful theoretical grounds for decision-makers, some important issues, such as connotation of the innovation motivation, factors of the motivation, motivation sources, are still difficult to characterize, and the literature on them is less extensive. To sum up, real research opportunities exist for enterprises’ motivation of technological innovation.

The rest of this paper is organized as follows. In the next section, motivation sources of technological innovation are analyzed, and five kinds of them are defined. The third section establishes an integrated model of motivation factors for enterprise technological innovation, and finally conclusions of this model are presented in the last section.

2 Motivation Sources of Enterprise Technological Innovation

In order to reveal the causality of enterprise technological innovation and to interpret the motivation of the innovation, researchers have put forward different innovation motivation theories, including technology-driving theory, market-pulling theory, technology driving and market pulling multiple-affecting theory, technological norm-track theory, and N-R(Need-Resource) theory. In many cases, when an enterprise does not undertake technological innovation, it may indicate that this
enterprise lacks the motivation instead of lacks the capability, condition or opportunity\textsuperscript{(2)}. On the basis of previous research work, this paper proposes five main types of motivation sources of enterprise technological innovation.

2.1 Technological driving innovation

The original source of technological innovation is science research, and after research the following steps are product design, sample production, large scale production and entering into the market (as shown in Figure 1). For example, when laser was discovered, initially people did not realize its value and there was no market demand for it. Then the value of laser was found out and even accelerated the rise of an industry. This example proves that, for enterprises, scientific and technological revolution is not only the power of continuous innovation, but also the basic resource factor or opportunity of continuous innovation\textsuperscript{(3)}. The development in science and technology would support an enterprise’s research and development technically, and would enhance the technological opportunity of products and production techniques. Technological driving motivation is the main motivation of technological innovation.

![Figure 1 Technological driving innovation model](image1)

2.2 Demands pulling innovation

Communication industry, chemical industry and automobile industry, in which customers take the dominant position, are usually demands pulling industries. Market demands include existing or potential, economic or non-economic demands. Customers’ changing demands and their feedback are the invaluable source of technological innovation. Successful innovation means accurately understanding the changing demands and fitting new products or service into market demands (as shown in Figure 2).

![Figure 2 Demands pulling innovation model](image2)
2.3 Market competition driving innovation

Market competition and operating crisis pressure would force enterprises to seek opportunities of technological innovation.

Every enterprise exists and develops under the pressure of market competition. The competition brings enterprises strong crisis consciousness, which mainly comes from market competing and enterprise operating status. The degree of perception of crisis is determined by the diathesis of entrepreneurs and staff. The crisis consciousness would accelerate technological innovation and help enterprises occupy the advanced position in the market competition. Sense of urgency and pressure of competition would bring out enthusiasm and creativity of the enterprise, and stimulate the motivation and activity of enterprise innovation. Enterprises would try their best to improve operating mechanism and promote competence. In this sense, market competition is an important factor, which shows market-pulling effect on technological innovation.

To ensure that competition effectively motivates technological innovation and leads innovation to normal functioning, the normative competition with proper strength should be kept. One reason is that only competition with proper strength is able to effectively motivate technological innovation. If the strength is too weak, the innovation would not be motivated; if it is too strong, the profit would shrink and the innovation investment would be weakened. Moreover, a too-strong competition may lead enterprises to price war and advertisement war, and reduce the profitability in turn, preventing the innovation. The other reason is that, instead of the difficult innovation, enterprises tend to use nonstandard methods, such as their privileges and superiority, to monopolize market and gain unreasonable economic interest. These enterprises would harm innovative enterprises in the profit and market space directly, and in the long-run development indirectly. This makes most of the enterprises could not get a high enough expected earning in the innovation.

2.4 Entrepreneur preference driving innovation

Thinking and preferring of an entrepreneur, such as superior insight and foresight, willing to take certain risk, the spirit of enterprise, curiosity of technology and economic phenomena, personal special interests, and pursuit of market profit, would inspire his innovation motivation and activity, and affect the success rate of technological innovation. Entrepreneur preference would promote subjective initiative in the innovation, make the starting-speed of innovation faster and shorten the innovation period. On the other hand, the economic benefit of the innovation is determined by the fitting innovation achievements with society demands, the scale of society demands and the leading consumption capability of innovation.

2.5 Government behavior driving innovation

Government is both the maker of market competition rules and the participator of the market activity through basic research and economic behavior as government purchase. The government’s attitude and policy towards scientific and technical activity and innovation would directly affect the success of enterprise innovation. According to national political goals and national economic development plan, government influences innovation of different levels in society through organization system, policy system, legal system and behavior system. To some extent, innovation has to follow the policy, or it will be hardly implemented. For example, a consumption policy is able to inhibit market demands or enlarge market demands, and has effects on enterprise innovation. Government motivates enterprise and industry innovation through pushing, pulling, participating and supporting. To encourage enterprise innovation, government would use tax reduction, loans at low or discounted interest, and technological innovation risk funds to benefit enterprises. To force enterprises to carry on innovation and to eliminate backward products, technology, equipments or even management methods, government may use penalty price support, publish products elimination catalogue periodically, set punitive taxation (high tax rate and high interest). To start up technological innovation, government could sign government purchase contracts and apply assigned government plans.

Government behavior driving has a quite strong effect especially on large scale innovation, high technology innovation and traditional Industry transformation using high technology. Domestic and foreign experience proves that large-scale big-profit innovation usually benefits from government.
behavior. Meanwhile, patent policy ensures the inventor’s interest through the exclusive property right, this guarantees the inventor economic return from his invention to inspire the inventor.

3 Integrated Model of Motivation Factors for Enterprise Technological Innovation

3.1 Factors analysis and model establishment

Michael Porter argued that the primary motivation of technological innovation is to gain competence[5]. It is a typical microeconomic issue to study the profit of technological innovation for an enterprise. The innovation profit can only be earned in the market competition. Goals for an enterprise to innovate are new products and new technology directly, and ensuring its strong position in market ultimately.

First, as an economic entity, the inner motivation of technological innovation for an enterprise is its profitability (in normal and rational economic environment). The decision of innovation depends on the expected benefit from technological innovation, which only can be realized in market competition. Therefore, the motivation issue closely connects to the study on the innovation benefit.

Secondly, innovative spirit of entrepreneurs would influence the innovation. The development of an enterprise, to some extent, is the development of the entrepreneur’s innovation capability and thinking, which are critical factors in the continuous developing process of an enterprise. Without an entrepreneur of innovating characteristic, the enterprise may be on the decline and even face the risk of bankruptcy.

Thirdly, only the inner demands of technological innovation would bring an enterprise the motivation of innovation. These inner demands include material interests demands and spiritual interests demands, which represent the enterprise’s pursuing of profit maximization in both material aspect and spiritual aspect. In spite of the subjective desire and external environment impact, an enterprise should consider the resource limitation and its inner environment to make the final decision of technological innovation. Factors, including the external environment, science and technology progress, society demands, market demands, market competition and government policy, have impacts on the inner demands and effect the motivation of technological innovation in turn.

Finally, it can be observed that enterprises applied their technological innovation strategy based on their competitors, therefore, the environment containing enterprises and their competitors would influence the expected innovation benefit. The technological innovation issue should be studied from an interactive aspect with economic system and environment[6].

Considering inner demands of the technological innovation subject, its resource, and its external environment, this paper analyzes the motivation factors and their functions, based on the analysis of the competitor’s expected interest from the technological innovation. According to the above analysis, the motivation factors model is established, shown in Figure 3.
3.2 Characteristics of the model
The motivation factors integrated model has the following characteristics:
(1) This model puts the technological innovation decision into a big system containing enterprises, society and market.
(2) This model considers not only external factors and constrains of technological innovation, but also the strategic interactive influence between the enterprise and its competitors.
(3) This model includes the impact of entrepreneur’s thinking on the innovation.
(4) The primary motivation factor of technological innovation is the expected benefit gained from the innovation, which is shown through two aspects, such as material interests and spiritual interests.
(5) The external factors of innovation motivation are technology pushing, market competition and government policy.
(6) The resource factors of innovation motivation include the internal environment of the enterprise, technological innovation capability and external environment constraint.

4 Conclusions
This paper analyzes the motivation of technological innovation and its factors, and argues that the primary motivation of innovation is expected benefit based on the competitors, including both material interests and spiritual interests. In spite of these subjective desires, an enterprise should take resource constraints and self-ability into account. Meanwhile, the innovation motivation is influenced by external environment, which include technology pushing, pressure of market competition and government policy encouragement. The external environment factors affect the inner demands of the enterprise technological innovation and in turn influence the activities of innovation.
References


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