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## The Driving Force of Enterprise Independent Innovation and Measures for Collaborative Operation of its Factors

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# The Driving Force of Enterprise Independent Innovation and Measures for Collaborative Operation of its Factors

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#### I. INTRODUCTION

t present, with the developing trend of economic globalization, competition between enterprises is increasingly presented by competition in economic and technological strength, and independent innovation has become the core and basis for sustainable development of an enterprise or even a country (Charles Carter, 1981) . The overall situation of independent innovation in Chinese enterprises is far from optimistic. Domestic and foreign experts agree that in most cases, scarcity of independent innovations in Chinese enterprises is not caused by lack of capacity, conditions or opportunity, but by lack of the driving force.(Fu Jiaji,2000).This paper establishes a model for the driving force of enterprise independent innovation, and proposes measures to promote collaborative operation of its factors, so as to provide new ideas and analysis framework for studies on the driving force of enterprise independent innovation.

#### II. Establishment of a Model for the Driving Force of Enterprise Independent Innovation

In order to construct a scientific model for the driving force of enterprise independent innovation, we visited several industrial enterprises to get the first-hand information about their independent innovation activity, and the key factors for enterprise independent innovation were summarized. Then, basing on a comprehensive study of literatures, field investigations and some other information, we designed the "questionnaire for the driving force of enterprise independent innovation" and sent it to enterprises to fill out. At last, statistical analysis was performed on 78 valid questionnaires returned, to confirm the key factors for enterprise independent innovation and to establish a model for the driving force of enterprise independent innovation.

This model for the driving force of enterprise independent innovation has a three-level hierarchical structure, "the overall driving force - four pillars factors". The overall driving force is supported by four pillars according to their different role in the system, -"funding, talents, technology, and environment". Whereas, "funding" contains a single factor for enterprise independent innovation - R&D investment; "talents" also contains a single factor - conditions of the R&D personnel; "technology" contains three factors technical conditions for innovation, expected success rate of R&D, accumulation of enterprise R&D achievements; and "environment" contains four factors market competition, incentive system for innovation, entrepreneurship, and enterprise culture (Table 1).

*Table 1 :* The Structure of Driving Force of Enterprise Independent Innovation

The subsystem	Factors
funding	R&D investment
talents	conditions of the R&D personnel
technology environment	technical conditions for innovation expected success rate of R&D accumulation of enterprise R&D achievements market competition incentive system for innovation entrepreneurship
	The subsystem funding talents technology environment

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#### III. Measures for Collaborative Operation of the Factors of The Driving Force of Enterprise Independent Innovation

Collaboration means all parts of a system shall work collaboratively, and synergy is the creation of a whole that is greater than the simple sum of its parts due to collaboration. Synergetics aims to establish concepts and methods to develop a unified view in dealing with complicated systems (Guo Zhian, 1989).

"Synergy results in order", synergy is inherent for any complicated system. By synergy of its factors, a system represents a macroscopic effect beyond the simple addition of its factors, during which the system achieves order and gains new stable structure. Synergistic collaboration of the internal and external factors and subsystems is required to achieve order of the driving force of enterprise independent innovation. Collaboration is the essential requirement, and for collaborative operation of this system, this paper proposes measures and suggestions from five aspects, to achieve orderly collaboration between funding, talents, technology, and environment.

#### a) To set accurate a goal for enterprise innovation

The innovation goal is the order parameter for enterprise independent innovation and the dominator of innovation activity. So, to achieve orderly collaboration of the driving force system, we must first accurately set the innovation goal.

#### i. To set up specific department for management of independent innovation

Enterprises shall set up specialized management department for independent innovation, to achieve standardized management of independent innovation activities. This department shall thoroughly master the innovation activity of the enterprise, to establish a solid basis for the innovation goal. Meanwhile, this department shall response properly to situations encountered during the innovation process, and establish timely and effective measures to better coordinate allocation of resources for independent innovation, which ensure accomplishment of the innovation goals.

### ii. To establish clear and effective standard for setting up of innovation goals

By what standard is an innovation goal regarded effective? It's the first question to be answered when setting up an innovation goal. It clarifies the standard for effectiveness of the goal, helps avoid detours during designing of the goal, and corrects inappropriateness of the goal.

## iii. To set up appropriate goals for independent innovation

First, an enterprise must understand that independent innovation has its risks, the department for independent innovation shall establish a evaluation system for assessment of such risk, taking into consideration previous innovations and conditions of the enterprise, so as to primarily estimate the success rate of independent innovation. The following two issue must be emphasized: 1, The risk assessment system must suit the enterprise, to comprehensively understand the risks for independent innovation; 2, talents on risk assessment shall be introduced to help ensure the reliable assessment of the risk.

Second, accumulation of previous achievements promotes subsequent innovation activity, the enterprise shall establish a innovation management system from the following two aspects: 1, to establish archives for independent innovation that clearly record the innovation process, so as to provide references for future innovation; 2, to organize participants of innovation projects to report about the innovation achievements, in which the reporter shall summarize the experience and lessons learned so as to guide future researches.

#### b) Greater R & D funding

#### i. The government shall provide more support for enterprise independent innovation

To provide subsidies for research. Subsidies shall be issued to help industrials that go along the national long-term development plan, those promoted strongly by the country, and those with high standard of creativity. The government shall evaluate the key projects strictly following the "application - verification supervision" procedure. Subsidies shall be issued in the primary R&D phase of a project, to supplement for the equipment cost and operating expenses. To issue interest-free loans. The government shall invest a certain amount annual financial resource as innovation loan. Enterprises shall develop an innovation project then apply for loans from the government. The loan shall be granted progressively, and later loan shall be basing on progress of the innovation project and repayments of the previous loans.

### ii. Enterprises shall enhance innovation funding themselves

Enterprises shall recognize the importance of innovation, and actively enhance innovation funding themselves. An enterprise shall understand that higher innovation investment to enhance innovation capacity is the basis to establish a brand name, to improve the competitiveness, and to expand the market share. An important measure to achieve the competitive strategy of product and cost differentiation. Meanwhile, an enterprise shall establish its own R&D foundation, and ensure exclusive use of these money in innovative research. An enterprise shall invest a certain amount of its annual income to R&D foundation according to the specific condition of the enterprise.

#### c) Emphasis on building of R&D team

#### i. Ensure sufficient R&D personnel

Innovation is the activity of a team that requires collaboration of personnel from multiple discipline and field. It can't be accomplished by a single or a handful of people. To ensure sufficient R&D personnel, we must first set up a team leader, and the core members of the team(Li Heng,2002). A proper mechanism for talent introduction must be established to enhance the introduction of domestic experts, overseas talents, or even mature innovation teams, which shall constitute the core of the innovation team and lead innovation activity of the enterprise.

#### ii. Improve quality of the R&D personnel

R&D personnel are the carrier of knowledge and technology of an enterprise, whose ideas need to be continuously refreshed and updated. First, enterprises must pay sufficient attention to the improvement of overall quality of the R&D team by regular training or inviting domestic and overseas experts to introduce cutting-edge technology. Second, enterprises shall lay emphasis on promising R&D personnel. Enterprises can send promising R&D personnel to relevant research institutions for in-depth study, and encourage R&D personnel to pursue a higher degree by allowing part or full-time study and providing tuition reimbursement for those who achieved a degree. At last, enterprises shall pursue cultivation of R&D personnel with international guality. Enterprises shall establish collaboration with overseas research institutions and regularly send R&D personnel for visits and communication.

#### d) Improve success rate of R&D subjects

As shown by the SD model of driving force system for enterprise independent innovation, success rate of innovation subjects can be improved from the following three aspects.

- i. By improving the research capacity of the R&D personnel. Improvement of research capacity of R&D personnel is the result of R&D team construction, as long as the enterprise adheres to construction of the R&D team, research capacity of the R&D personnel would steadily improve.
- ii. By improving technical conditions for independent innovation. To achieve this, the enterprise is required to set up new-product R&D center and research laboratory and to introduce sophisticated internationally advanced equipment and other research resources; to regularly maintain and update the research equipment; and to collaborate with domestic and foreign research institutions and laboratories, so as to break through bottle necks in researches.

- iii. By introducing (purchase) mature technologies. Although introduced (purchased) technology is not the result of independent innovation, they can be optimal material for studying, internalization, and recreation. In this way, the R&D process can be largely accelerated and the success rate can be improved. At current stage, domestic technology is somewhat behind the international standard. "Introduction - internalization - recreation" is a nice way to shorten this distance and to improve success rate of R&D activities by domestic enterprises.
- *e) Improve the environment for independent innovation* Which should be carried out from the following aspects:
  - i. Cultivate the innovation spirit of the entrepreneurs

To cultivate the innovation spirit of an enterprise. First, the innovation spirit of the entrepreneurs must be cultivated. The leaders shall continuously enrich themselves by participating MBA, EMBA courses to learn scientific management and mature management methods, and to cultivate a modern management concept and strategic thinking. Second, we must extend the horizons of the entrepreneur's innovation view, and refresh the concept of innovation. They shall understand advanced technology and broaden their innovation thinking. Lastly, the government shall stimulate the entrepreneur's willingness for innovation, for example, by enhancing promotion and incentives for successful innovation, to get the innovation concept and activity widely recognized, to amplify the incentive and exemplary effect on the entrepreneurs.

#### ii. Cultivate a culture that favours enterprise innovation

To cultivate a culture that favours enterprise innovation, we must first establish the lofty status of innovation in the employee's mind. By adopting the people-oriented management philosophy and fully respecting the personnel's values and requirements, an enterprise shall make its personnel feel trusted and belonging, and willing to devote themselves to the enterprise. Second, the concept of innovation shall be deeply embedded in the personnel's heart, to make everyone passionate for innovation. Lastly, the culture of innovation shall be always enhanced to become a culture. By constructing a comprehensive enterprise management system, innovation activity can be integrated into the daily management of the enterprise and get standardized(Xiang Gang, Wang Yingluo,2004).

#### iii. Improve internal incentive system for innovation

Innovation thinking of the personnel shall get recognized and awarded. The enterprise shall establish a reward system for innovation, and bring the innovators proper incentives, such as promotions, honour, bonuses, paid vacations, and so on. Spiritual incentives may include: promotion opportunities for principle and grassroots leaders, and key research personnel; better research and work conditions for the innovation team; to establish an innovation contribution awards (medals, trophies, etc.) for outstanding individual or team in innovation; a two-week or longer vacation for the participants of a project when completed, to make them relaxed both physically and mentally, so that they can perform better in the next phase of work. And material incentives may include innovation prize (to grant bonuses for the research personnel after completion of a subject in accordance with the number and quality of contribution, for the outstanding contributors, generous prize shall be awarded; equity incentive, a certain proportion of the profits of the new product can be awarded to the designer in the form of shares under his/her name.

#### IV. Conclusion

This paper first established a model for enterprise independent innovation, addressing the problems about coordinate operation of its factors, measures and suggestions were proposed from 5 major aspects, including accurate goal for innovation projects; greater R&D investment; emphasis on construction of R&D team; measures to improve success rate of innovation; and construction of an environment that favours independent innovation. Hopefully, these measures and suggestions shall provide effective methods for collaborative operation of the innovative factors in domestic enterprises, and references for continuous development of innovation activities.

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