

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

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Abstract

The field survey, this article through to the enterprise to build the enterprise independent innovation motivation system, from accurate set objectives, increase the intensity of RD investment enterprise innovation, attaches great importance to the RD team building, improve research and development success rate, optimize the environment of the independent innovation and so on five aspects, proposed our country enterprise independent innovation motivation system to guarantee the coordinated operation of the way and countermeasure.

Index terms— independent innovation; power system; synergy; countermeasures.

1 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 Porter,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.

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 pillarsfactors". 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). 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 Hian,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

45 and gains new stable structure. Synergistic collaboration of the internal and external factors and subsystems is
46 required to achieve order of the driving force of enterprise independent innovation. Collaboration is the essential
47 requirement, and for collaborative operation of this system, this paper proposes measures and suggestions from
48 five aspects, to achieve orderly collaboration between funding, talents, technology, and environment.

49 **2 a) To set accurate a goal for enterprise innovation**

50 The innovation goal is the order parameter for enterprise independent innovation and the dominator of innovation
51 activity. So, to achieve orderly collaboration of the driving force system, we must first accurately set the
52 innovation goal. i. To set up specific department for management of independent innovation Enterprises shall
53 set up specialized management department for independent innovation, to achieve standardized management
54 of independent innovation activities. This department shall thoroughly master the innovation activity of the
55 enterprise, to establish a solid basis for the innovation goal. Meanwhile, this department shall response properly
56 to situations encountered during the innovation process, and establish timely and effective measures to better
57 coordinate allocation of resources for independent innovation, which ensure accomplishment of the innovation
58 goals.

59 **3 ii. To establish clear and effective standard for setting up of 60 innovation goals**

61 By what standard is an innovation goal regarded effective? It's the first question to be answered when setting up
62 an innovation goal. It clarifies the standard for effectiveness of the goal, helps avoid detours during designing of
63 the goal, and corrects inappropriateness of the goal. iii. To set up appropriate goals for independent innovation
64 First, an enterprise must understand that independent innovation has its risks, the department for independent
65 innovation shall establish a evaluation system for assessment of such risk, taking into consideration previous
66 innovations and conditions of the enterprise, so as to primarily estimate the success rate of independent innovation.
67 The following two issue must be emphasized: 1, The risk assessment system must suit the enterprise, to
68 comprehensively understand the risks for independent innovation; 2, talents on risk assessment shall be introduced
69 to help ensure the reliable assessment of the risk.

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

75 **4 b) Greater R & D funding**

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

85 **5 ii. Enterprises shall enhance innovation funding themselves**

86 Enterprises shall recognize the importance of innovation, and actively enhance innovation funding themselves.
87 An enterprise shall understand that higher innovation investment to enhance innovation capacity is the basis to
88 establish a brand name, to improve the competitiveness, and to expand the market share. An important measure
89 to achieve the competitive strategy of product and cost differentiation. Meanwhile, an enterprise shall establish
90 its own R&D foundation, and ensure exclusive use of these money in innovative iii. By introducing (purchase)
91 mature technologies.

92 Although introduced (purchased) technology is not the result of independent innovation, they can be optimal
93 material for studying, internalization, and recreation. In this way, the R&D process can be largely accelerated and
94 the success rate can be improved. At current stage, domestic technology is somewhat behind the international
95 standard. "Introduction -internalization -recreation" is a nice way to shorten this distance and to improve success
96 rate of R&D activities by domestic enterprises.

97 **6 e) Improve the environment for independent innovation**

98 Which should be carried out from the following aspects:

99 i. Cultivate the innovation spirit of the entrepreneurs

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

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

116 iii. Improve internal incentive system for innovation Innovation thinking of the personnel shall get recognized
117 and awarded. The enterprise shall establish a reward system for innovation, and bring the innovators proper
118 incentives, such as promotions, honour, bonuses, paid vacations, and so on. Spiritual incentives may include:
119 promotion opportunities for principle and grassroots leaders, and key research personnel; better research. An
120 enterprise shall invest a certain amount of its annual income to R&D foundation according to the specific condition
121 of the enterprise. c) Emphasis on building of R&D team i. Ensure sufficient R&D personnel Innovation is
122 the activity of a team that requires collaboration of personnel from multiple discipline and field. It can't be
123 accomplished by a single or a handful of people. To ensure sufficient R&D personnel, we must first set up a team
124 leader, and the core members of the team(Li ??eng,2002). A proper mechanism for talent introduction must be
125 established to enhance the introduction of domestic experts, overseas talents, or even mature innovation teams,
126 which shall constitute the core of the innovation team and lead innovation activity of the enterprise.

127 ii. Improve quality of the R&D personnel R&D personnel are the carrier of knowledge and technology of an
128 enterprise, whose ideas need to be continuously refreshed and updated. First, enterprises must pay sufficient
129 attention to the improvement of overall quality of the R&D team by regular training or inviting domestic and
130 overseas experts to introduce cutting-edge technology. Second, enterprises shall lay emphasis on promising R&D
131 personnel. Enterprises can send promising R&D personnel to relevant research institutions for in-depth study,
132 and encourage R&D personnel to pursue a higher degree by allowing part or full-time study and providing
133 tuition reimbursement for those who achieved a degree. At last, enterprises shall pursue cultivation of R&D
134 personnel with international quality. Enterprises shall establish collaboration with overseas research institutions
135 and regularly send R&D personnel for visits and communication. d) Improve success rate of R&D subjects As
136 shown by the SD model of driving force system for enterprise independent innovation, success rate of innovation
137 subjects can be improved from the following three aspects. i. By improving the research capacity of the R&D
138 personnel. Improvement of research capacity of R&D personnel is the result of R&D team construction, as long as
139 the enterprise adheres to construction of the R&D team, research capacity of the R&D personnel would steadily
140 improve. ii. By improving technical conditions for independent innovation. To achieve this, the enterprise is
141 required to set up new-product R&D center and research laboratory and to introduce sophisticated internationally
142 advanced equipment and other research resources; to regularly maintain and update the research equipment; and
143 to collaborate with domestic and foreign research institutions and laboratories, so as to break through bottle
144 necks in researches.

145 research and work conditions for the innovation team; to establish an innovation contribution awards (medals,
146 trophies, etc.) for outstanding individual or team in innovation; a two-week or longer vacation for the participants
147 of a project when completed, to make them relaxed both physically and mentally, so that they can perform
148 better in the next phase of work. And material incentives may include innovation prize (to grant bonuses for
149 the research personnel after completion of a subject in accordance with the number and quality of contribution,
150 for the outstanding contributors, generous prize shall be awarded; equity incentive, a certain proportion of the
151 profits of the new product can be awarded to the designer in the form of shares under his/her name.

152 IV.

153 7 Conclusion

154 This paper first established a model for enterprise independent innovation, addressing the problems about
155 coordinate operation of its factors, measures and suggestions were proposed from 5 major aspects, including
156 accurate goal for innovation projects; greater R&D investment; emphasis on construction of R&D team; measures
157 to improve success rate of innovation; and construction of an environment that favours independent innovation.
158 Hopefully, these measures and suggestions shall provide effective methods for collaborative operation of the
159 innovative factors in domestic enterprises, and references for continuous development of innovation activities. ¹

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Figure 1: 2

1

	Independent Innovation	
	The subsystem	Factors
Driving	funding	R&D investment
Force		
of	talents technol-	conditions of the R&D personnel technical conditions
Enterprise	ogy	
Inde-		
pendent		
Innovation		
		for innovation
		expected success
		rate of R&D
		accumulation of
		enterprise R&D
		achievements
	environment	market competition
		incentive system for
		innovation
		entrepreneurship
		enterprise culture

Figure 2: Table 1 :

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