

# Impact of External Learning and Organizational Flexibility on Radical Innovation

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**Abstract:** This paper studied the theories of external learning, organizational flexibility and radical innovation, presented a conceptual model and relevant hypothesis. On analyzing the effective sample data from 682 enterprises of different industries across 10 provinces and cities in China, the empirical results showed that external learning is conducive to organizational resource flexibility and competence flexibility, organizational resource flexibility is non-conductive to radical innovation, but it is more appropriate for high competent flexible corporation to undertake radical innovation. This reflects that strengthening external learning is conducive to improve organizational resource flexibility and competence flexibility, thus is helpful to promote organizational radical innovation as well enhance organizational survival and development capacity.

**Keywords:** External learning; Resource flexibility; Competence flexibility; Radical innovation

## 1 Introduction

In an increasingly global competition, continuous innovation is the necessary conditions of the corporate existence and development. In order to achieve innovation, enterprises must rapidly accumulate knowledge, technology and capacity. The current competitive situation forces the enterprises to obtain the newest knowledge beyond the organizational boundaries, to quickly improve their own innovation ability. In this context, it has become their major cause that the enterprises upgrade their resources and capacity levels and promote innovation through external learning. On the other hand, facing the dramatic changes of business environment, many scholars realize that external learning is an important means to improve the organizational flexibility, and that the organizational flexibility has close relationship with the innovation risk and performance. For example, Hemphill(1996)<sup>[1]</sup> cares that the impact of organizational flexibility and internal cooperation on innovation, he pointed out that organizational flexibility requires the unity of flexibility and diversity, requires change, innovation and novelty, includes dynamic and flexible mechanism, and provides the enterprises with the resilience coping with internal and external environmental change. Thereby, the in-depth study on the relationship of external learning, organizational flexibility and radical innovation is very necessary and has a practical significance.

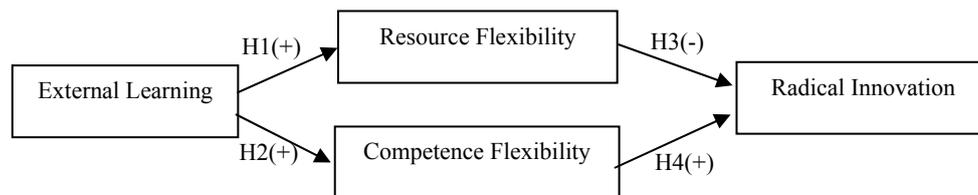


Figure 1 Impact of External Learning and Organizational Flexibility on Radical Innovation

## 2 Theoretical Premises

### 2.1 External learning

For global operation and competition, as well as the development of information technology, external learning takes a more and more important place in the process of ability building and innovation supporting. External learning mainly means enterprises carrying through a series activities such as knowledge collecting, transfer, application and innovation by clients, suppliers, competitors and multiform copartners. According to Child's(1984)<sup>[2]</sup> opinion, external learning ability is mainly decided by the following factors: transfer ability of knowledge itself, copartners' receptivity to new knowledge, organizational members' ability to understanding and absorbing new knowledge, organizational members' ability to summarizing experiences and so on.

### 2.2 Organizational flexibility

Organizational flexibility shows a potential capacity of organization, which is jointly determined by

the inherent flexibility of organizational disposable resources and the ability to use these resources in a series of possible options. By Sanchez (1997)<sup>[3]</sup>, organizational flexibility should include resource flexibility and competence flexibility. Necessary resource flexibility can be described in three dimensions of potential resource uses: (1) when the scope of resource is expanded, the resource is more flexible. In essence, if resource can be used to develop, manufacture, distribute and sell different products, resource has large flexibility. (2) When resource's switching cost is small, the resource has large flexibility. For instance, when the switching cost of turning the resource from manufacturing one product to manufacturing another is reduced, the flexibility of this production line is enlarged. (3) When the transfer process requires less time, the resource has large flexibility. If the transfer from using the resource to manufacture one product to manufacture another product requires less time, the flexibility of production system is enlarged.

Here, we think competence flexibility is the competence choice scope in which organizations can identify new resource, integrate and allocate resources to bring all the resources to the full play through adventurous thinking approach. Generally speaking, competence flexibility can be measured by the means of the time, the cost, and the effectiveness for responding to the changing environment. Sanchez(1997)<sup>[3]</sup> holds that competence flexibility comprises the following three important dimensions: (1) identify the boundary of resource uses. The capabilities include the decisions on create, produce and/or sell products or services. (2) Identify and build the resource chain for strategic changes. The capability reflect the degree of sharing organizational resources or organizational network and reflect the association between organizational resources and the activities in creating, manufacturing and selling products or services. (3) Build the organizational system and process in which the organization can make the best use of acquired resources for targeted objectives. The capabilities refer to the effectiveness of managing resource chains for planned objectives.

With the increase of environmental uncertainty, resource flexibility and competence flexibility could help organizations effectively improve their capabilities of coping with uncertain environment.

### **2.3 Radical innovation**

The classification of technological innovation approaches has many criterion. Since innovation degree in business practice is extremely important, the innovations of different degree have different effect on the enterprises' performance, and different environmental and internal elements promote the innovations of different degree. Based on the different degree of technological innovation, technological innovation can be categorized into incremental innovation and radical innovation (Ettlie, 1983)<sup>[4]</sup>.

Radical innovation is fundamental changes that represent revolutionary change in technology. It represents clear departures from existing practice. Radical innovation will change the structure of an industry and replace an old industry (e.g., vacuum tube) with an entirely new one (e.g., micro-electronics). Meanwhile, the risks of radical innovation are greater than those of incremental innovation. Apparently, the management of radical innovation differs enormously from that of incremental innovation. It requires a long-time and thorough strategic planning, huge investment in research and development (R&D), a practical plan and an effective management.

## **3 Presentation of Hypothesis**

### **3.1 External learning and organizational flexibility**

Generally speaking, new knowledge can changes existing resources and capacities levels so as to promote innovation, its acquiring ways have internal development and external learning. Internal development means an organization is based entirely on its internal resources and capacity to develop its proprietary technology. External learning is that two organizations take knowledge sharing, transfer and development by the form of agreement, contract or commitment. Because of the experiential impact, organizations will form a routine to cope with environmental change, so that they tend to use the old ways to solve the problems in internal development, therefore, they can not more effectively change the existing resources and capacity situation fundamentally.

External learning makes different enterprises form cooperative relations such as alliance so as to strengthen knowledge communication and innovation, concerns about the acquisition and accumulation of new knowledge and skills, makes enterprises' knowledge source channels and knowledge structure more enrich. Grant(1996)<sup>[5]</sup> considers that the switching process of turning some resource from one use to another may require the common action of multi-knowledge, and external learning leads to different knowledge (the know-how to use resources) sharing, transfer and the formation of new knowledge of among the partners of alliance. With the knowledge sharing and creating, enterprises will gradually

deepen understanding for the original resources, and enlarge the boundary of organizational resource uses. With the improvement of the efficiency of resource uses, the switching cost of turning some resource from one utility to another is small, the switching process also requires less time, so the resource has large flexibility.

***Hypothesis 1: external learning is conducive to improving organizational resource flexibility.***

On the other hand, under the dynamic environment, enterprises need to constantly update their knowledge and ability system, but they can not rely on internal development to rapidly develop new capacity, and to obtain external new skills and knowledge. But external learning makes them have access to other organizational knowledge and skills, qualify to imitate and apply; at the same time, the embedded business and personnel exchanges in cooperation greatly speed up the transfer and application of the knowledge and skills between the partners, so as to expand their knowledge scope, hold the know-how to use the resources. Competence flexibility is the competence choice scope, when the competence choice scope is expanded, the competence is more flexible. The skills and knowledge that the enterprise acquires through external learning can be brought into the following results: firstly, it may expand the applied scope of "ability to extend"; it may also be used to increase the stock of resources or improve the quality of existing resources, it can also improve enterprises' original capacity to a new level in order to create "new capabilities". Secondly, the combination of the external knowledge, skills and the internal original resources, capacity will be manifested as a new capacity; this undoubtedly expands the competence choice scope. This shows that external learning process is to enhance the process of organizational competence flexibility.

***Hypothesis 2: external learning is conducive to improving organizational competence flexibility.***

### **3.2 Organizational flexibility and radical innovation**

Radical innovation is a high risk innovation behavior, it requires the resource of innovation process, which has higher value contribution and more use efficiency. However, the higher resource flexibility is, the lower its exclusive is a particular use efficiency of such resource generally is not as good as exclusive assets in the mutual constraints of efficiency and flexibility, so resource flexibility is not conducive to improving the efficiency of radical innovation. On the other hand, radical innovation is not usually satisfied with the demand of consumer awareness, but creates the new demand which consumers are not previously aware of. This demand from innovative ideas to implementation shows different characteristics from previous demand, According to the explanation of resource-based theory and capability-based theory for innovation process, in the same capability situation, radical innovation can not establish the basis of using the same resources with the past, either enterprises introduce new resources, or they employ other uses of existing resources in the case of losing efficiency. Therefore, the higher the enterprises' resource flexibility is, the more unconducive the enterprise is to undertake radical innovation.

***Hypothesis 3: the higher the organizational resource flexibility is, the more unconducive the organization is to undertake radical innovation.***

With the increase of changing and uncertain environmental factors, that enterprises acquire valuable, rare, inimitable, and non-substitutable resources to maintain their competitive advantage in market competition is very difficult. Therefore, organizational competence flexibility is a key issue. If the constitutive elements of competence can be coordinated with each other, organizational competence has well adaptability, pioneering and rivalrousness; these will reflect the effect of competence flexibility. On the other hand, we should also realize that the expressive level of competence has a close relationship with the support of resources. Competence flexibility includes not only the overall coordination of its own constitutive elements, but does resource- competence interaction. Therefore, in a changing environment, enterprises can rely on competence flexibility to discover new resources, and integrate, configure their own resources to play a greater value; thereby they effectively improve the capacity of coping with uncertain environment.

One of the biggest features of technological innovation is the uncertainty or risk, radical innovation means that the uncertainty of entire organization in the coming period. If organizations improve its dynamic adaptability on the outside world, they can boost the successful rate of innovation, reduce risk and uncertainty. The enterprises with competence flexibility can find significant market change and make a quick response for it, expand the uses of resources, effectively allocate resources and improve the use efficiency of existing resources, thus greatly increase the capacity of making full use of existing resources. The enterprises not only successfully achieve partial and continuous improvement, but also get involved in new product markets and develop new product, therefore, the higher competence flexibility the enterprises have, the more likely they are to undertake and radical innovation. On the

other hand, enterprises' competence flexibility is opposite to its competence rigidity which presents an insurmountable inertia. Such rigidity is unconformable to environmental change, often interferes with enterprises' innovative activities. In accordance with these assertions, we propose the following hypothesis.

**Hypothesis 4: the higher competence flexibility the organization has, the more conducive it is to undertake radical innovation.**

## 4 Research Methodology

### 4.1 Samples and data collection

For the sake of increasing the representativeness of the sample enterprises with different income levels, districts, ownerships in China, we have done a large-scale questionnaire to various kinds of enterprises (mainly including the ones of state-owned, three types of foreign-funded, collective (partnership), private and township) across ten provinces and cities. It is required that this investigation concentrates in the industry of manufacturing (mainly including the electron, machinery, pharmaceutical industry, processing and so on). Before formal investigation, we made a pre-investigation and randomly selected to investigate more than 10 enterprises in Hubei provinces, and perfected the questionnaire according to the result of feedback.

This research collects data by E-mail. We assigned 1950 questionnaires totally, and some people didn't originally reply a letter, we sent E-mail to them again. At last 28 questionnaires were sent back for they can't be delivered, so we got 773 questionnaires back. It's a pity that 91 of 773 were eliminated because of non-cooperation, liquidation of enterprises and incomplete research information. As results there were 682 available questionnaires. Up to December of 2009, the overall response rate for the survey was 39.64% and the effective rate was 34.97%, given that the surveys were completed by CEOs or their designees; most respondents held upper-management positions and had averaged 8.3 years with the same enterprise, undergraduates or above occupies 61.8%. Generally speaking, in the research of social science, it is acceptable that the response rate of top managers reaches 20%, so the result of this research is creditable.

### 4.2 Measures

Because of the difficulty in applying objective scales on external learning, organizational capabilities and innovation activities, all multi-item measures are based on 7-point Likert scales, from 1 (strongly disagree) to 7 (strongly agree). The Likert scales are appropriate if no objective scale. Through it, multi-aspect information that cannot be reflected by objective indexes can be obtained. The variables and indexes used in this paper are as follows:

According to Dyer & Singh(1998)<sup>[6]</sup>, 5 indexes were used to measure external learning mainly: (1) frequently collecting the demand and preference information of customers; (2) often collecting the strategic information of suppliers; (3) often collecting the information of technological development trends; (4) making a practice of object-oriented market research; (5) often collecting information by trade journals, governmental publications and news media. The Cronbach's coefficient alpha for this scale is 0.7982.

According to Sanchez's(1997)<sup>[3]</sup> research, 3 indexes were used to measure organizational resource flexibility mainly: (1) the high degree of using the same resource to develop, manufacture and sell different products or services in your corporation; (2) many hierarchies existing in your corporation; (3) high degree of sharing common corporate resources between different units inside the organization. The Cronbach's coefficient alpha for this scale is 0.7145.

According to Alge's(2002)<sup>[7]</sup> research, 3 indexes were used to measure organizational competence flexibility mainly: (1) highly competent in reducing the market development time; (2) highly competent in operate in unknown business; (3) highly competent in coping with changes. The Cronbach's coefficient alpha for this scale is 0.8059.

According to Ettlie etc (1984)<sup>[8]</sup>, 4 indexes were used to measure the radical innovation mainly: (1) creates products of new capability; (2) introduces latest ideas into product research and development; (3) develops and introduces brand-new technique in its industry; (4) the inventor of new craft and technique; The Cronbach's coefficient alpha for this scale is 0.7511.

## 5 Analysis and Results

This paper firstly uses SPSS to do a preliminary analysis of questionnaire, and assesses the model's reliability and validity, which can assure that the method used in the following analysis is reliable and

valid; then we also use AMOS to analyze and test the model fitness and each path.

### 5.1 Reliability analysis

To validate the reliabilities of every scale, we analyze all factors. Generally speaking, reliability coefficients of 0.7 or higher are considered adequate; moreover loading factors in the more than 0.6 are considered effective, and all the indicators we used meet the requirements of model validation.

### 5.2 Model-fitness assessment

We use AMOS to analyze and test the whole model in this study, after comparison and optimization of the model; we achieve the overall results (see Table 1). As it can be seen, the theoretical model fits the actual data better; this means the whole structure model more accurately reflects the actual situation, so the result of the data analysis is acceptable.

**Table 1 Model Consistence Testing Result**

Testing Indicators	Model Evaluation	Explanations
Model fit		
P	0.361	Larger than 0.05, good
Discrepancy/df	1.001	Approximate 1, good
GFI	0.993	Approximate 1, good
Adjusted GFI	0.995	Approximate 1, good
RMSEA	0.023	Smaller than 0.05, good
Model comparison		
NFI	0.992	Approximate 1, good
IFI	0.996	Approximate 1, good
TLI	0.994	Approximate 1, good
CFI	0.995	Approximate 1, good
Model parsimony		
P close	0.999	Approximate 1, good
AIC fit	286.171	Small value, good

### 5.3 Hypothesis testing

The test result of each hypothesis is in Table 2. The result shows that all hypotheses pass the test. This means the theoretical model is supported by the empirical research and better supports the theoretical perspectives and anticipations in this essay.

**Table 2 Hypotheses Testing Result**

Hypothesis	Description of Paths	P- Value	Standardized Coefficient	Results
H1	External Learning→ Resource Flexibility	0.013	0.389	Support
H2	External Learning→ Competence Flexibility	0.025	0.576	Support
H3	Resource Flexibility→ Radical Innovation	0.046	-0.193	Support
H4	Competence Flexibility→ Radical Innovation	0.027	0.658	Support

## 6 Conclusion

Through the above analysis, we can find, firstly, in the complex and volatile environment, external learning is conducive to improving organizational resource flexibility and competence flexibility, so as to enhancing their survival and development capacity.

Secondly, in this essay, we respectively explore the organizational resource flexibility and competence flexibility's influences in radical innovation. The reason for conducting a separate research lies in the difference between resources and competence. Resource is valuable, comparatively scarce, transactable, and able to exist in different forms. However, organizational competence refers to the capability of allocating organizational resources, which is comprehensive, and the capability of achieving expected results out of organizational arrangements. The empirical result expresses that it is more appropriate for high competence flexible corporation to undertake radical innovation.

Thirdly, empirical result implies that to promote organizational flexibility is conducive to cooperating radical innovation activities through external learning. From the perspective of strategic flexibility, the organization with some flexibility will to some extent help organizations to resolve some difficulties in innovation activities under the pressure of competitive environment.

In conclusion, enterprises should carefully take account of their needed flexibility type and level. From the perspective of external learning, those firms must improve resource flexibility and competence flexibility, build and hold the rational combination of non-routine managerial flexibility, structural flexibility and operational flexibility so as to redouble their efforts to meet the challenges of the risks and uncertainties in the process of radical innovation and to achieve sustained competitive advantages.

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