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# THE INFLUENCE OF KNOWLEDGE ACQUISITION ON RADICAL INNOVATION IN OPEN INNOVATION NETWORKS: A CASE STUDY OF KUNMING ENTERPRISES IN YUNNAN PROVINCE, CHINA

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**Abstract**

With the advent of economic globalization and the era of knowledge economy, enterprises are faced with the challenge of increasingly complex and dynamic external environment. radical innovation is an important way for enterprises to gain sustainable competitive advantage. Based on a questionnaire survey, this study examines the effects of internal knowledge depth, internal knowledge breadth and external knowledge acquisition on radical innovation. A questionnaire survey was conducted in Kunming City, Yunnan Province, China, and 640 valid questionnaires were obtained. It is found that the depth of internal knowledge will weaken the enterprise's environmental adaptability and technology learning ability; The width of internal knowledge can improve the adaptability of enterprises to the environment and the cognition of new technology; Moderate acquisition of external knowledge is conducive to the tracking of technological development, but may also distract the attention of enterprises to the market. Research shows that knowledge acquired from different channels has different impacts on innovation. Enterprises need to allocate knowledge depth, breadth and external access to continue to carry out radical innovation.

**Key words:** Knowledge Acquisition / Radical Innovation / Knowledge Depth / Knowledge Breadth

## 1 INTRODUCTION

The year 2023 is an important year for China to achieve the "two centenary goals" and not to experience major changes in a century. Faced with the impact of COVID-19 and the rise of emerging technologies, it is urgent for enterprises to realize scientific and technological innovation through open innovation networks. Innovation network has become an important means for enterprises to gain competitive advantage [18]. Some successful cases show that innovation network can help enterprises achieve knowledge acquisition and innovation breakthrough [26]. However, there are also some problems in the innovation network, such as large differences among partners, low knowledge acquisition efficiency, lack of knowledge integration ability, etc., resulting in the innovation network cannot be sustained or cannot achieve radical innovation. Therefore, research on how to promote knowledge integration through knowledge acquisition in innovation network to achieve radical innovation is of great significance to guide enterprise management practice.

Radical innovation refers to the change of scientific paradigm based on knowledge breakthrough and is an important achievement achieved in the development of science, emphasizing the elimination of obstacles to scientific progress, the creation of new theories or the improvement of existing theories [20]. Knowledge, especially scarce and unique knowledge resources, is regarded as the key for enterprises to gain competitive advantage. radical innovation is essentially a process of knowledge management [27]. Heterogeneous and recessive knowledge is an important source of radical innovation [18]. Knowledge reorganization and creation are also the conditions for radical innovation [32][31]. Therefore, enterprises need to acquire knowledge from the outside to complement the internal knowledge base and support radical innovation [9].

As an important way for enterprises to acquire external knowledge [17], innovation network can promote enterprises to realize radical innovation through the flow and integration of knowledge. Existing studies have found that knowledge acquisition in innovation network has an important impact on technological innovation of enterprises. However, the specific mechanism and process of the influence remain to be further explored.

## 2 RESEARCH QUESTION AND RESEARCH OBJECTIVE

In the new economic situation, innovation network has become an important way for organizations to realize innovation [14][28]. Through network cooperation, organizations can acquire external knowledge, expand their knowledge base, and support innovative practices. However, there are also some problems in the innovation network, such as complicated partnership, insufficient knowledge acquisition, shallow knowledge value mining, etc., resulting in the inability of organizations to effectively achieve innovation goals [5][6][8]. Based on the background of innovation network, how organizations achieve innovation through knowledge acquisition and integration has become an emerging research direction. Current studies have found that knowledge acquisition in networks has a positive impact on organizational innovation, but the specific mechanism and process are still unclear [10][11]. Therefore, this study focuses on the following issues:

RQ1: How are the different dimensions of knowledge acquisition defined in innovation networks?

RQ2: Do these dimensions have an impact on radical innovation?

To clarify these questions, the purpose of this study is to:

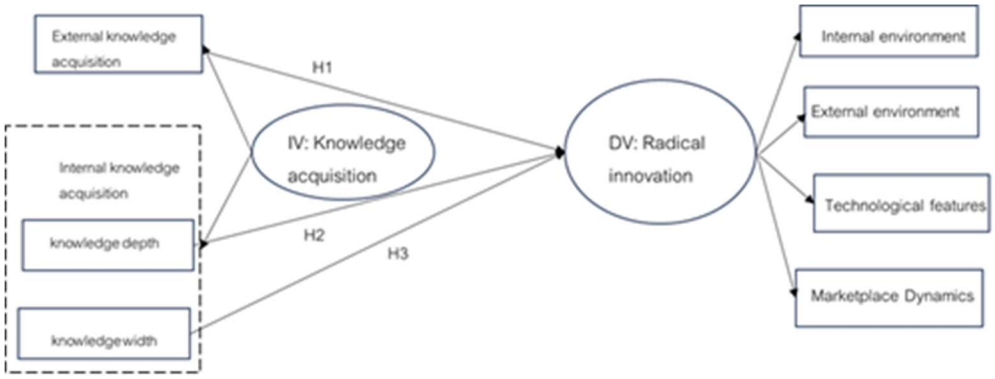
RO1: Define the dimensions of knowledge acquisition and explore the impact of different dimensions on enterprise radical innovation.

RO2: Analyze the specific mechanism of knowledge acquisition on radical innovation.

This is of great significance to guide organizations how to effectively carry out knowledge acquisition and management in the innovation network, so as to stimulate innovation vitality.

## 3 CONCEPTUAL FRAMEWORKS

The independent variable in this study is knowledge acquisition, and the dependent variable is radical innovation. A theoretical model is developed based on the literature evaluation, study objectives, and research questions. The specifics are illustrated in Figure 3.1




## 4. METHODOLOGY

In this study, quantitative research methods were used to collect data by questionnaire survey, and then data analysis was carried out to verify the hypothesis.

### 4.1 Sample selection and data collection

We used the questionnaire data to test the proposed hypothesis.

Based on a random sampling method, the researchers sent out invitations to participate in the survey to 500 enterprises in five main urban areas of Kunming City, Yunnan Province, China, and finally 305 enterprises agreed to participate in the survey. A total of 1000 questionnaires were sent out both online and offline, and 737 questionnaires were collected, with a recovery rate of 73.7%. Through the questionnaire quality inspection, 85 invalid questionnaires and 12 questionnaires with missing values were found. After these questionnaires were eliminated, a total of 640 valid questionnaires were obtained, with an effective rate of 64%. The questionnaires were filled out by managers and ordinary employees.

### 4.2 Data processing methods

This study needs to test the linear relationship, and structural equation model (SEM) is relatively mature in this aspect. In view of this, this study adopts the linear regression method to test the hypotheses proposed. This method is widely used and can better ensure the accuracy and stability of the study.

## 5. EMPIRICAL ANALYSIS

### 5.1 Reliability and validity

First of all, this paper carries out reliability test to test whether different subjects can get consistent results at different times and places, that is, the stability of the scale. Cronbach's α value was used in this paper to test the reliability of the scale. Generally, a Cronbach's α value between 0.65 and 0.70 is acceptable, a Cronbach's α value between 0.7 and 0.8 is good, and a Cronbach's α value greater than 0.8 is very good. In this paper, analysis software was used to test the reliability of the collected data. The results showed that Cronbach's α coefficient of each measurement item of knowledge acquisition and radical innovation was greater than 0.8 (see Table 4 1 for details), so the reliability of the scale in this paper was relatively stable.

Secondly, we conducted a validity test to consider whether the data analysis results could truly reflect the characteristics of latent variables. The common values of the six main factors are all much higher than 0.5, indicating that the information of the study can be effectively extracted. At the same time, the factor load coefficient of each subitem of the factor matrix is greater than 0.5,

and the KMO value is greater than 0.6, indicating that the scale of this study has a high validity (see Table 4 1for details).

**Table 4 1 Reliability and validity**

| Variable | Dimension | Items | Cronbach alpha | Factor load coefficient | Common factor variance | KMO |
|---|---|---|---|---|---|---|
| Radical innovation | Technological features | 1.Degree of the innovation merges with existing paradigms. | 0.872 | 0.830 | 0.688 | 0.862 |
| | | 2.Potential of leading related technological developments, deployments and applications. | | 0.836 | 0.699 | |
| | | 3.Maturity and reliability of the supporting technologies or the related infrastructures. | | 0.848 | 0.719 | |
| | | 4.Easiness of diffusion of the innovation among its target audience | | 0.750 | 0.563 | |
| | Marketplace dynamic | 5.Realization of certain functions that improve the satisfaction of clients through simplification of related technologies. | 0.801 | 0.798 | 0.638 | 0.699 |
| | | 6.Introduction of the innovation via occupying the new niche markets | | 0.879 | 0.773 | |
| | | 7.Profitability of upstream, downstream and all other collaborative firms associated with the innovation | | 0.830 | 0.688 | |
| | | 8.Reduction of the cost of acquiring certain functions, services or products | | 0.835 | 0.698 | |
| | External environment | 9.Scale of policy-related impact on development and adoption of the innovation, both positive and negative | 0.804 | 0.875 | 0.766 | 0.700 |
| | | 10.Influence of macroeconomic situation on the development and adoption of the innovation | | 0.855 | 0.731 | |
| | Internal environment | 11.Firms often develop entirely new technologies | | 0.815 | 0.663 | |
| Knowledge acquisition | External knowledge acquisition | 1.We have learned and mastered our alliance partners' technical expertise through study | 0.863 | 0.835 | 0.697 | 0.831 |
| | | 2.We have learned and mastered our alliance partners' product development skills through study | | 0.869 | 0.756 | |
| | | 3.We have learned and mastered our alliance partners' market development skills through study | | 0.792 | 0.627 | |
| | | 4.We have learned and mastered our alliance partners' production operation skills through study | | 0.803 | 0.644 | |

| Variable | Dimension | Items | Cronbach alpha | Factor load coefficient | Common factor variance | KMO |
|---|---|---|---|---|---|---|
| | | 5.We have learned and mastered our alliance partners' management skills through study | | 0.747 | 0.557 | |
| | Internal knowledge acquisition (width of knowledge) | 6.Our company has accumulated a wide range of information on various niche markets | 0.917 | 0.873 | 0.762 | 0.881 |
| | | 7.Our company's technical/R&D staff possess a very broad range of technical knowledge beyond our field of expertise | | 0.846 | 0.716 | |
| | | 8.Our company's understanding of customer groups includes diverse information from different markets and consumer segments | | 0.881 | 0.776 | |
| | | 9.Our company extensively grasps various information about different competitors | | 0.863 | 0.745 | |
| | | 10.Our company has mastered multiple types of management knowledge and skills | | 0.872 | 0.761 | |
| | Internal knowledge acquisition (depth of knowledge) | 11.We are very familiar with the industry in which our company operates | 0.914 | 0.889 | 0.791 | 0.873 |
| | | 12.Our technical/R&D staff have a profound expertise and knowledge reserve in our field | | 0.882 | 0.778 | |
| | | 13.We have a deep understanding and mastery of relevant technical knowledge in our industry | | 0.862 | 0.743 | |
| | | 14.We have accumulated extensive and in-depth experience and knowledge in the specific niche markets we serve | | 0.850 | 0.723 | |
| | | 15.We have a thorough and deep understanding of our customers' needs and their changing trends | | 0.828 | 0.686 | |

## 5.2 Confirmatory factor analysis

First, we used analysis software to test the measurement relationship of each measurement item. Based on the principle of extracting eigenvalues greater than 1, 6 main factors are extracted, The results showed that all observed variables of the scale were on the latent variables corresponding to the theoretical hypothesis, and the load coefficients of each sub-item were greater than 0.6(see Table 4 2 and Table 4 3 for details), indicating that the measurement items of the factors had a good measurement relationship.

Table 4 1 Knowledge acquisition Factor load coefficient table

| Factor (latent variable) | Measure item (explicit variable) | Non-standard load factor (Coef.) | Standard error (Std.Error) | *z* (CR value) | *p* | Standard load factor (Std.Estimate) |
|---|---|---|---|---|---|---|
| | We learned the technical expertise of our alliance partners | 1.000 | - | - | - | 0.726 |

Table 4 1 Knowledge acquisition Factor load coefficient table

| Factor (latent variable) | Measure item (explicit variable) | Non-standard load factor (Coef.) | Standard error (Std.Error) | *z* (CR value) | *p* | Standard load factor (Std.Estimate) |
|---|---|---|---|---|---|---|
| External knowledge acquisition | We learned the product development skills of our alliance partners | 1.137 | 0.061 | 18.640 | 0.000 | 0.755 |
| | We learned the market development skills of our alliance partners | 1.033 | 0.063 | 16.320 | 0.000 | 0.664 |
| | We have mastered the production and operation skills of our alliance partners through learning | 1.103 | 0.061 | 17.986 | 0.000 | 0.729 |
| | We acquired the management skills of our alliance partners through learning | 1.428 | 0.074 | 19.238 | 0.000 | 0.778 |
| Width of knowledge | A very wide range of relevant information on different market segments is accumulated within the company | 1.000 | - | - | - | 0.792 |
| | The technical/R&D people within the company have a very broad background of technical knowledge outside of the technical areas in which the company operates | 0.990 | 0.044 | 22.403 | 0.000 | 0.794 |
| | The company's internal understanding of customer groups contains different information about different consumer groups in different markets | 1.107 | 0.047 | 23.699 | 0.000 | 0.828 |
| | The company has a wide range of information about different competitors | 1.030 | 0.046 | 22.267 | 0.000 | 0.790 |
| | A wide variety of management knowledge and skills are mastered within the company | 1.045 | 0.044 | 23.569 | 0.000 | 0.825 |
| Depth of knowledge | We are very familiar with the industry in which we operate | 1.000 | - | - | - | 0.844 |
| | Our technical/R&D personnel have a deep technical attainments and knowledge base in the fields in which our company operates | 1.019 | 0.038 | 26.704 | 0.000 | 0.837 |
| | For the relevant technical knowledge in the industry, we have a very deep grasp and understanding | 0.976 | 0.039 | 24.910 | 0.000 | 0.802 |

Table 4 1 Knowledge acquisition Factor load coefficient table

| Factor (latent variable) | Measure item (explicit variable) | Non-standard load factor (Coef.) | Standard error (Std.Error) | *z* (CR value) | *p* | Standard load factor (Std.Estimate) |
|---|---|---|---|---|---|---|
| | We have a lot of very deep experience and knowledge in our particular market segment | 0.842 | 0.036 | 23.338 | 0.000 | 0.769 |
| | We have a very deep and thorough understanding of the needs of our customers and their changing trends | 0.901 | 0.039 | 23.020 | 0.000 | 0.762 |

Note: The bar '-' indicates that the item is a reference item.

Table 4 2 Radical innovation Factor load coefficient table

| Factor (Latent variable) | Measure item (explicit variable) | Non-standard load factor (Coef.) | Standard error (Std.Error) | *z* (CR value) | *p* | Standard load factor (Std.Estimate) |
|---|---|---|---|---|---|---|
| Technical features | The degree of innovation is incorporated into existing models | 1.000 | - | - | - | 0.767 |
| | Leadership potential in relevant technology development, deployment and application | 1.016 | 0.053 | 19.120 | 0.000 | 0.776 |
| | The maturity and reliability of the supporting technology or associated infrastructure | 1.037 | 0.053 | 19.490 | 0.000 | 0.792 |
| | The ease with which the innovation is disseminated to the target audience | 0.797 | 0.051 | 15.573 | 0.000 | 0.638 |
| | Improve customer satisfaction by simplifying the relevant technology to enable certain functions. | 0.936 | 0.053 | 17.780 | 0.000 | 0.723 |
| Market Dynamics | Your business introduces innovation by capturing new market segments | 1.000 | - | - | - | 0.781 |
| | Your business has the ability to collaborate profitably with upstream, downstream and all its businesses related to innovation | 1.021 | 0.056 | 18.186 | 0.000 | 0.691 |
| | Your organization may take steps to reduce the cost of | 1.077 | 0.055 | 19.489 | 0.000 | 0.732 |

Table 4 2 Radical innovation Factor load coefficient table

| Factor (Latent variable) | Measure item (explicit variable) | Non-standard load factor (Coef.) | Standard error (Std.Error) | *z* (CR value) | *p* | Standard load factor (Std.Estimate) |
|---|---|---|---|---|---|---|
| Environment | obtaining certain features, services, or products The extent to which policies influence the development and adoption of innovation in your business | 1.000 | - | - | - | 0.768 |
| | The impact of macroeconomic conditions on innovation development and adoption in your business | 1.078 | 0.053 | 20.163 | 0.000 | 0.767 |
| Environment | The degree to which the company is willing to develop new technologies to achieve innovation | 0.973 | 0.054 | 18.061 | 0.000 | 0.697 |

Note: The bar '-' indicates that the item is a reference item.

Then, we use the obtained results to calculate, and the average variance extracted AVE value of all constructs is higher than 0.5. And the combined reliability CR value is much higher than the threshold of 0.7 (Fornell & Larcker, 1981) (see Table 4 4, which indicates that this scale has good aggregation validity.

**Table 4 4 Model AVE and CR**

| Variable | Factor | Items | AVE | CR |
|---|---|---|---|---|
| Radical innovation | Technological features | 5 | 0.550 | 0.858 |
| | Marketplace dynamic | 3 | 0.541 | 0.779 |
| | External environment | 2 | 0.555 | 0.789 |
| | Internal environment | 1 | | |
| Knowledge acquisition | External knowledge acquisition | 5 | 0.535 | 0.852 |
| | Internal knowledge acquisition (width of knowledge) | 5 | 0.649 | 0.903 |
| | Internal knowledge acquisition (depth of knowledge) | 5 | 0.646 | 0.901 |

Source: Data reduction

## 5.3 Hypothesis Testing

This study mainly examines the impact of knowledge acquisition on radical innovation, that is, the impact of two dimensions of knowledge acquisition on radical innovation. On the basis of structural equation, confirmatory factor analysis is carried out for the relationship between variables. The specific results are shown in Table 4 5.

**Table 4 5 Model regression coefficient results**

Model regression coefficient results

| X | - | Y | Unstandardized regression coefficient | *SE* | *z* (CR) | *p* | Standardized regression coefficient |
|---|---|---|---|---|---|---|---|
| Depth of knowledge | - | Radical innovation | 0.164 | 0.041 | 4.043 | 0.000 | 0.164 |
| Width of knowledge | - | Radical innovation | 0.159 | 0.038 | 4.208 | 0.000 | 0.159 |
| External knowledge acquisition | - | Radical innovation | 0.080 | 0.035 | 2.306 | 0.021 | 0.080 |

As shown in Table 4 4, the standardized path coefficient value of the influence of external knowledge acquisition on radical innovation is 0.080, greater than 0, and presents significance (z=2.306, p=0.021<0.05), indicating that external knowledge acquisition will have a significant positive impact on radical innovation. Hypothesis 1 is supported.

As for the influence of knowledge depth of internal knowledge acquisition on radical innovation, the standardized path coefficient value is -0.164, less than 0, and shows significance (z=-4.043, p=0.000<0.01), indicating that knowledge depth of internal knowledge acquisition will have a significant negative impact on radical innovation. Hypothesis 2 is supported.

The standardized path coefficient value of the knowledge width of internal knowledge acquisition on the impact of radical innovation is 0.159, greater than 0, and shows significance (z=4.208, p=0.000<0.01,), indicating that the knowledge width of internal knowledge acquisition will have a significant positive impact on radical innovation. Hypothesis 3 is supported.

In order to further test the influence of knowledge acquisition on radical innovation, the researchers conducted regression analysis on each dimension of knowledge acquisition and each dimension of radical innovation. In order to ensure the stability of the test, the internal and external environmental factors of radical innovation are integrated into one factor. The results are shown in Table 4 6.

Table 4 3 Model regression coefficient results

| X | - | Y | Unstandardized regression coefficient | *SE* | *z* (CR) | *p* | Standardized regression coefficient |
|---|---|---|---|---|---|---|---|
| Depth of knowledge | - | Environment | 0.12 | 0.055 | 2.192 | 0.028 | 0.12 |
| Width of knowledge | - | Environment | 0.188 | 0.049 | 3.801 | 0 | 0.188 |

Table 4 3 Model regression coefficient results

| X | - | Y | Unstandardized regression coefficient | *SE* | *z* (CR) | *p* | Standardized regression coefficient |
|---|---|---|---|---|---|---|---|
| External knowledge acquisition | - | Environment | 0.019 | 0.043 | 0.452 | 0.652 | 0.019 |
| Depth of knowledge | - | Marketplace dynamic | 0.185 | 0.048 | 3.819 | 0 | 0.185 |
| Width of knowledge | - | Marketplace dynamic | 0.067 | 0.044 | 1.526 | 0.127 | 0.067 |
| External knowledge acquisition | - | Marketplace dynamic | 0.094 | 0.038 | 2.488 | 0.013 | 0.094 |
| Depth of knowledge | - | Technological features | 0.157 | 0.042 | 3.73 | 0 | 0.157 |
| Width of knowledge | - | Technological features | 0.162 | 0.038 | 4.261 | 0 | 0.162 |
| External knowledge acquisition | - | Technological features | 0.08 | 0.033 | 2.435 | 0.015 | 0.08 |

**As can be seen from the above table:**

1. When knowledge depth has an impact on environmental factors, the standardized path coefficient value is -0.120<0, and this path presents a significance of 0.05 (z=-2.192, p=0.028<0.05), indicating that knowledge depth has a significant negative impact on environmental factors.

2. For the influence of knowledge width on environmental factors, the standardized path coefficient value is 0.188>0, and this path presents a significance level of 0.01 (z=3.801, p=0.000<0.01), thus indicating that knowledge width has a significant positive impact on environmental factors.

3. When external knowledge acquisition has an impact on environmental factors, this path shows no significance (z=0.452, p=0.652>0.05), indicating that external knowledge acquisition does not have an impact on environmental factors.

4. For the influence of knowledge depth on market dynamics, the standardized path coefficient value is -0.185<0, and this path presents a significance level of 0.01 (z=-3.819, p=0.000<0.01), which indicates that knowledge depth will have a significant negative impact on market dynamics.

5. When knowledge width has an impact on market dynamics, this path does not show a significant relationship (z=1.526, p=0.127>0.05), which indicates that knowledge width does not have an impact on market dynamics.

6. When external knowledge acquisition has an impact on market dynamics, the standardized path coefficient value is -0.094<0, and this path presents a significance level of 0.05 (z=-2.488, p=0.013<0.05), indicating that external knowledge acquisition will have a significant negative impact on market dynamics.

7.When knowledge depth has an impact on technical features, the standardized path coefficient value is -0.157<0, and this path presents a significance of 0.01 level (z=-3.730, p=0.000<0.01), thus indicating that knowledge depth will have a significant negative impact on technical features.
8.When the knowledge width affects the technical features, the standardized path coefficient value is 0.162>0, and the path presents a significance level of 0.01 (z=4.261, p=0.000<0.01), thus indicating that the knowledge width will have a significant positive influence on the technical features.
9.When external knowledge acquisition has an impact on technical features, the standardized path coefficient value is 0.080>0, and this path presents a significance of 0.05 (z=2.435, p=0.015<0.05), thus indicating that external knowledge acquisition will have a significant positive impact on technical features.

## 6. CONCLUSIONS AND IMPLICATIONS

### 6.1 Conclusions

In order to answer the question of how to improve radical innovation through internal and external knowledge acquisition in an open environment, this paper studies
The influence of internal and external knowledge acquisition on radical innovation. Based on the open innovation theory, knowledge management theory and dynamic resource management theory, this paper puts forward three hypotheses, and uses the data of 305 enterprises to test the hypotheses. The results show that: (1) the width of internal knowledge acquisition is conducive to radical innovation; (2) the depth of internal knowledge acquisition has a negative impact on radical innovation. (3) External knowledge acquisition has a positive impact on radical innovation.
Further, by exploring the impact of each dimension of knowledge acquisition on each dimension of radical innovation, this study finds that:

1) The depth of knowledge has a negative impact on environmental factors, market dynamics and technical characteristics. This indicates that the higher the depth of knowledge acquisition inside an enterprise, the lower the sensitivity of the enterprise to the changes of external environment, the higher the inertia of the enterprise, and the disadvantageous for the enterprise to adjust the strategic direction according to the changes of external environment. Over-reliance on in-depth internal knowledge accumulation tends to form path dependence, which reduces the adaptability of enterprises to external markets and technologies.

2) Knowledge width has a positive influence on environmental factors and technical characteristics. This shows that the wide range of knowledge acquisition can improve the cognition and adaptability of enterprises to the external environment, and the acquisition of wide knowledge can help enterprises accumulate various resources to cope with environmental changes. At the same time, the breadth of knowledge can also help enterprises pay attention to new technologies in various fields and master the latest technical features.

3) External knowledge acquisition has a negative impact on market dynamics and a positive impact on technical features. This shows that the acquisition of external knowledge can enable enterprises to keep abreast of the latest technological development, but excessive dependence on

external knowledge will also lead to the neglect of market dynamics and reduce the sensitivity to market changes.

4) External knowledge has no influence on environmental factors. This may indicate that the acquisition of external knowledge is not directly related to the adaptability of enterprises to macro environmental changes.

### 6.2 Enlightenment

The conclusions of this paper have implications for enterprises to effectively carry out radical innovation:

1) It is found that the knowledge depth of internal knowledge acquisition has a negative influence on radical innovation. Therefore, managers should realize that over-mining knowledge depth may inhibit radical innovation, and should control internal knowledge depth at a certain level. At the same time, the research also finds that the width of internal knowledge acquisition can promote radical innovation, which reminds enterprises to pay attention to the balance between knowledge depth and knowledge width when carrying out internal knowledge acquisition, and make choices in different situations.

2) Knowledge acquisition will affect the radical innovation of enterprises through different mechanisms. Enterprises need to establish a sound knowledge management system, improve the flexibility of knowledge acquisition, and achieve a better balance between internal and external knowledge acquisition, so as to obtain sustainable competitive advantages in the complex and dynamic external environment.

3) Expanding the breadth of internal knowledge acquisition can help enterprises adapt to changes in the external environment, especially the emergence of new technologies. Companies should establish mechanisms to encourage employees to acquire a wide range of knowledge.

4) According to their own circumstances, enterprises should balance the acquisition of internal knowledge depth and breadth, while also acquiring external knowledge, so as to achieve a keen perception of environmental changes and rapid adaptation.

## 7 INNOVATE AND LOOK FORWARD

The innovation of this research is mainly reflected in the following three aspects:

First, it distinguishes the difference of internal knowledge depth and knowledge width on firm innovation, and expands the research on the dimensions of knowledge acquisition. In the existing researches, there are few comprehensive studies on the influence of internal knowledge acquisition on innovation from the two dimensions of knowledge depth and knowledge width.

Second, this study examines the complementary effects of both internal and external knowledge acquisition on firm innovation, which enriches and expands the research results of radical innovation in the context of open innovation.

Third, this study not only examines the impact of different types of knowledge acquisition on firm innovation, but also further examines their differential impact on firms' environmental adaptability and technology learning ability, expanding and deepening the research on the mechanism of knowledge acquisition's impact on firms' radical innovation.

At the same time, there are still some shortcomings in this study. First, this study only focuses on the influence of knowledge acquisition on innovation, and does not investigate the subsequent links such as knowledge transfer and internalization and absorption, which need to be further improved. Second, due to the limitations of sample size and source, the generalization of the research conclusions needs to be further tested. Third, the questionnaire survey method used in this study may have some subjective judgment, and the subsequent research can consider introducing more objective knowledge acquisition and radical innovation measurement indicators.

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