Research on the Influence of External Knowledge Management on Enterprise Performance

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Abstract

While implementing internal knowledge management, enterprises also need to grasp the latest cost, technology, and market information through external knowledge management, to maintain competitive advantage, and improve market position and enterprise performance. Taking FH Lightning protection Equipment Co., LTD as the research object, this study explores the relationship between external knowledge management and enterprise performance. Research data were obtained through questionnaires, and the hypothesis model was tested by correlation analysis and multiple regression analysis. This study draws the following conclusions: both external knowledge acquisition and external knowledge transformation have a significant positive correlation with enterprise performance, and external knowledge transformation is a partial mediating effect between external knowledge acquisition and enterprise performance. The research has a certain guiding significance for implementing knowledge management strategies in the lightning protection industry.

Keywords

External Knowledge Management; Enterprise Performance; Multiple Regression Analysis.

1. Introduction

As human society moves from the era of the industrial economy to the era of the knowledge economy, knowledge management plays an increasingly important role in the development and competition of enterprises[1]. In the current information society, knowledge change is constantly accelerating and improving efficiency. In addition to updating knowledge through internal member innovation, it is also crucial for enterprises to acquire relevant information knowledge such as the technology market from outside and implement corresponding knowledge management.

Knowledge management has been applied and developed in many industries, but for example, FH Company's knowledge management in most of the lightning protection industry is fragmented and has not yet formed a knowledge management system. For the lightning protection industry, acquiring and transforming external knowledge in the supply chain, technology and market is the key to improving enterprise performance. Therefore, this study takes external knowledge transformation as an intermediary variable, analyzes the mechanism of external knowledge management on enterprise performance, and tests the relationship between external knowledge acquisition, external knowledge transformation, and enterprise performance through empirical research.

2. Theoretical Basis

2.1. External Knowledge Managemen

The concept of knowledge management was first proposed by Peter Drucker, an American management professor, in the 1960s. At that time, he believed that human beings were entering

a knowledge society, and the main economic resources of the future society were no longer capital, natural resources, and labor, but information and knowledge[2]. In 1995, Ikujiro Nonaka and Hirotaka Takeuchi proposed the SECI model based on the classification of tacit knowledge and explicit knowledge proposed by Michael Polanyi, namely, to realize the spiral of knowledge creation by managing the transformation process of tacit knowledge and explicit knowledge. It has laid a milestone foundation in the research of knowledge transformation[3].

In terms of research on external knowledge management, Shi et al. (2012) proposed that enterprises should enhance their strategic planning, incentive, control, and cultural construction capabilities and improve the competitiveness of organizations by integrating internal information and external related information[4]. Cheng (2013) proposed that the knowledge management of an enterprise is not only related to the enterprise's capabilities but also affected by the external environment. An effective combination of an enterprise's advantages and the use of external resource information can better realize its knowledge innovation and technological development [5].

2.2. External Knowledge Acquisition

For the definition of external knowledge acquisition, there is no unified view in academic circles. Among them, Lyles (2015) proposed that external knowledge acquisition is a kind of knowledge acquired from partners, including technology, skills, products, R&D, market, management, and other knowledge[6]. Knowledge acquisition has different knowledge acquisition paths according to different knowledge classification standards. Wu et al. (2003) pointed out that external knowledge acquisition mainly includes trade and cooperation with suppliers, customers, intermediaries, governments, and other partners, as well as forms such as patent purchase and licensing, as well as communication in addition to these interest behaviors[7].

2.3. External Knowledge Transformation

Li et al. (2016) pointed out that knowledge transformation is the main form of knowledge management and the focus of knowledge management research[8]. The knowledge transformation process after acquiring external knowledge is an internal process in essence, which is not fundamentally different from the existing research on knowledge transformation.

In terms of the mechanism of knowledge transformation, the most famous and representative Japanese scholars Ikujiro Nonaka and Hirotaka Takeuchi studied the knowledge innovation process of Japanese enterprises. The Spiral of Knowledge model, namely The "SECI Model", was proposed in The Knowledge-Creating Company in 1995[9]. In this model, Ikujiro Nonaka mainly presents the relationship between the mutual transformation and interaction of tacit and explicit knowledge in the process of enterprise innovation activities. Meanwhile, he divides organizational knowledge transformation into four stages. They are Socialization, Externalization, Combination, and Internalization[10].

2.4. Enterprise Performance

In terms of the concept of enterprise performance, Brigham et al. (1991) proposed: "Performance evaluation is a measurement method used to judge and prove whether the pre-planned objectives have achieved the expected results. Performance measurement is also used to measure the efficiency or effectiveness of a system as a whole or parts of a system to see if its processes are meeting set objectives."[11]

In terms of knowledge management and enterprise performance evaluation theory, Allen & Helms (2002) proposed that the effectiveness of knowledge management is usually expressed in the form of enterprise performance, including three dimensions: Financial performance (including profitability, return on investment, and solvency), business performance (including operating performance, market share, value-added ability, and satisfaction), organizational effectiveness (including efficiency, effectiveness, quality, and capacity)[12]. Zhang et al. (2017)

designed an evaluation index system for the effectiveness of enterprise tacit knowledge management based on the correlation between knowledge chain and balanced scorecard, taking knowledge management indicators such as knowledge acquisition and storage, tacit knowledge sharing and knowledge management process, as well as enterprise performance indicators such as financial indicators and enterprise growth as dimensions[13].

3. Hypotheses

3.1. External Knowledge Acquisition and Enterprise Performance

External knowledge acquisition is the first step of enterprise external knowledge management. The importance of external knowledge acquisition has also been recognized by more and more researchers, who generally believe that the ability to seek and obtain external knowledge will directly affect the competitive strength of enterprises[14]. Lane et al. (2001) found that the degree of knowledge acquisition has a significant impact on performance[15]. Jiang et al. (2010) proved a significant positive correlation between external knowledge acquisition and enterprise performance through empirical research[16]. Yu (2012) believes that the knowledge acquired and accumulated by enterprises from partners and competitors will drive the growth of enterprises and enable them to better face the complex market environment[17].

FH company has a close cooperation relationship with its partners and needs to acquire various external knowledge from partners to carry out business. FH company fully acquires and grasps all kinds of external tacit and explicit knowledge, which is crucial for improving enterprise performance and promoting enterprise development. Therefore, based on the above analysis, the following hypotheses are proposed:

H1: External knowledge acquisition has a positive impact on enterprise performance.

H1a: External tacit knowledge acquisition has a positive impact on enterprise performance.

H1b: External explicit knowledge acquisition has a positive impact on enterprise performance.

3.2. External Knowledge Transformation and Enterprise Performance

External knowledge transformation is the most important link of external knowledge management and the key step to improving enterprise performance through knowledge management. After acquiring external knowledge, enterprises can carry out knowledge sharing, integration, innovation, and application through the knowledge transformation process.

Chen (2003) pointed out that knowledge integration can promote the generation of new knowledge through knowledge reorganization, and can also promote professional collaboration and technical research and development capabilities, thus improving performance[18]. Yu (2011) explored the influence of knowledge transformation on enterprise competitiveness through empirical analysis based on the SECI model[19]. Zhu (2015) holds that tacit knowledge acquisition has a positive effect on enterprise performance through empirical research, and knowledge transformation plays a mediating role[20].

The spiraling process of external knowledge transformation enables enterprises to master more information and capabilities and promote the improvement of enterprise performance. Therefore, based on the above analysis, the following hypotheses are proposed:

H2: External knowledge transformation has a positive impact on enterprise performance.

H2a: External knowledge socialization has a positive impact on enterprise performance.

H2b: The externalization process of external knowledge has a positive impact on enterprise performance.

H2c: The process of external knowledge integration has a positive impact on enterprise performance.

H2d: The implicit process of external knowledge has a positive impact on enterprise performance.

3.3. External Knowledge Acquisition and Knowledge Transformation

Acquiring knowledge from outside is a prerequisite for enterprises to transform and utilize external knowledge, but there are few types of researches on the potential relationship between them. The whole process of external knowledge transformation is based on external knowledge acquisition: acquisition of external tacit knowledge is the basis of external knowledge socialization and externalization, and acquisition of external explicit knowledge is the basis of external knowledge integration and implicit[20]. Huang (2018) also believes that knowledge acquisition is an antecedent influencing factor of knowledge transformation. Knowledge acquisition can accelerate the rate of knowledge transformation and thus promote the improvement of enterprises' innovation capability[21]. Therefore, based on the above analysis, the following hypotheses are proposed:

H3: Partner knowledge acquisition has a positive influence on its knowledge transformation process.

H3a: Tacit knowledge acquisition of partners has a positive impact on the process of knowledge socialization.

H3b: Tacit knowledge acquisition of partners has a positive influence on the process of knowledge externalization.

H3c: Explicit knowledge acquisition of partners has a positive impact on the process of knowledge integration.

H3d: Explicit knowledge acquisition of partners has a positive influence on the process of knowledge implicit.

3.4. The Mediating Role of External Knowledge Transformation

Through external knowledge acquisition, enterprises can obtain a large amount of knowledge accumulation and have an important impact on enterprise performance. However, according to the survey results, in the lightning protection industry, the performance of some enterprises with high knowledge base reserves is not high. These enterprises usually lack a knowledge management strategy and knowledge transformation mechanism. Enterprises and employees cannot effectively utilize external knowledge and meet the needs of partners, which ultimately leads to the loss of partners and low corporate performance.

Nan (2010) constructed a conceptual model of knowledge transformation from the perspective of knowledge acquisition, believing that information acquired by enterprises needs to be effectively transformed before it can be effectively used to promote enterprise innovation and produce performance[22]. Peng et al. (2014) proposed that knowledge transformation plays a mediating role between technological learning and technological ability based on the research results on knowledge learning, technological innovation ability, and knowledge management [23]. Therefore, based on the above analysis, the following hypotheses are proposed:

H4: External knowledge transformation plays a mediating role in the relationship between external knowledge acquisition and enterprise performance.

H4a: External knowledge socialization plays a mediating role in the relationship between external tacit knowledge acquisition and enterprise performance.

H4b: External knowledge externalization plays a mediating role in the relationship between external tacit knowledge acquisition and enterprise performance.

H4d: External knowledge composition plays a mediating role in the relationship between external explicit knowledge acquisition and enterprise performance.

H4c: Implicit external knowledge plays a mediating role in the relationship between external explicit knowledge acquisition and enterprise performance.

Based on the above assumptions, this paper establishes a relationship model of external knowledge acquisition -- external knowledge transformation -- enterprise performance(see Figure 1).

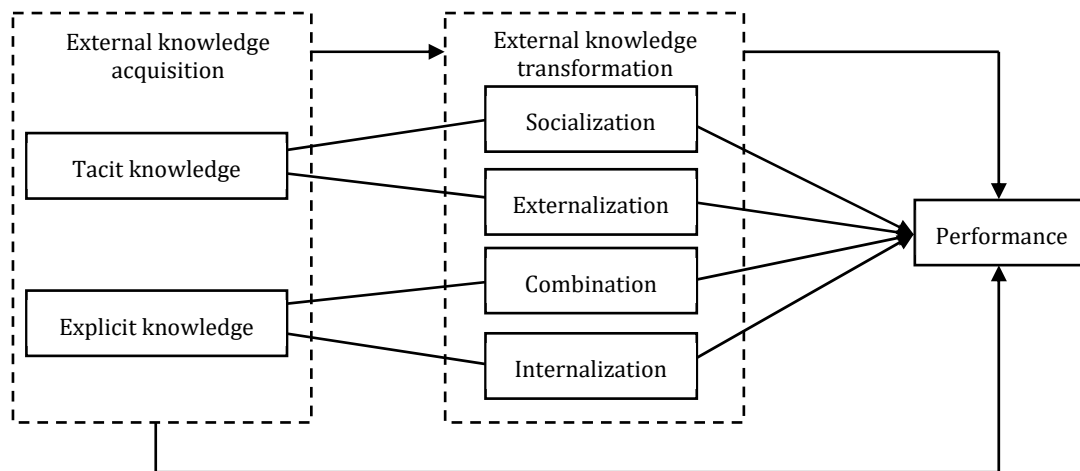**Figure 1.** Hypothesis model

4. Variable Measurement and Date Collection

4.1. Variable Measurement

For external knowledge acquisition, this paper improves based on referring to the knowledge acquisition approach introduced by Wu et al.[7], and Sherwood & Covin's scale setting of knowledge acquisition in the two dimensions of explicit knowledge and tacit knowledge, and each dimension contains four items [24].

For the investigation of external knowledge transformation, this paper refers to the empirical research conducted by some scholars at home and abroad based on Nonaka's "SECI Knowledge transformation Model". Based on the scale of knowledge transformation proposed by Holsapple[25], Jian[26], and Tang et al.[27], an adaptive modification was made in connection with the reality of FH Company and interview results, and finally, a scale of four dimensions of socialization, externalization, combination, and internalization with four items each was obtained.

For the investigation of external knowledge transformation, this paper refers to the empirical research conducted by some scholars at home and abroad based on Nonaka's "SECI Knowledge transformation Model". Based on the scale of knowledge transformation proposed by Holsapple[25], Jian26] and Tang et al.[27], the adaptability of the FH company and interview results was modified, and finally, the scale of socialization, externalization, combination and, internalization was obtained with 4 items in each dimension.

For the measurement of enterprise performance, this study sets a total of 5 items for the enterprise performance scale by referring to the relevant theories of Robert[11] and Allen[28] and the measurement scale of Liao[29] and Lou[30].

4.2. Date Collection

In this study, a total of 260 questionnaires were issued and 242 were recovered, with a recovery rate of 93%. The questionnaire will be used by those who have a certain understanding of external knowledge management of the lightning protection industry and have a certain understanding of the basic situation of the company's partners and competitors. And only those

who have worked in FH Company for one year or more are selected as valid questionnaires for this study. Excluding a small number of other invalid answers, a total of 219 valid questionnaires were obtained. There were 23 invalid questionnaires, and the effective rate was 90.5%.

5. Results and Discussion

5.1. Reliability Analysis

To ensure the reliability of the questionnaire scale, it is necessary to conduct a stability analysis of the questionnaire, namely the reliability test. Cronbach's α coefficient method was used in this paper to test, and the CITC value of the total correlation of correction items was used to eliminate items with high correlation with other items. After excluding relevant items, the scale contains a total of 28 items. According to the analysis results of the overall data of the sample, Cronbach's α coefficient value is 0.825 and greater than 0.7, indicating high overall reliability of the scale. In addition, this paper also carries out a reliability analysis for each variable, and the analysis results are shown in Table 1.

Table 1. Reliability test results of each variable (N=219)

Variables		Items	Cronbach's α	
External Knowledge Acquisition(KA)	TK	TK1,TK2,TK3,TK4	0.813	0.897
	EK	EK1,EK2,EK3,EK4		0.914
External Knowledge Transformation(KT)	KS	KS1,KS2,KS3,KS4	0.819	0.905
	KE	KE1,KE2,KE3,KE4		0.823
	KC	KC1,KC2,KC3,KC4		0.889
	KI	KI1,KI2,KI3,KI4		0.810
Enterprise performance(P)		P1,P2,P3,P4	0.817	

According to Table 1, the Cronbach's α coefficient of each variable and its corresponding factor is greater than 0.8, the CITC value of each item meets the lower limit of 0.4, and the Cronbach's α value of each variable is greater than the α value of each item after deletion of the variable. Therefore, the test shows that the scale and data reliability in this study is good, and the data internal consistency level is high.

5.2. Validity Analysis

Validity analysis is to test the validity of the collected data reflected on the investigated content. The higher the validity, the more consistent the data collection results are with the research content[31]. Principal component analysis and maximum variance rotation methods in factor analysis were adopted in this study, and the eigenvalue greater than 1 was taken as the criterion of factor extraction. The analysis results show that external knowledge acquisition, external knowledge transformation, and enterprise performance pass validity verification.

5.3. Hypothesis Testing

This paper adopts multiple stepwise regression analysis to test the correlation and mediating relationship among external knowledge acquisition, external knowledge transformation, and enterprise performance. In this part, SPSS 21.0 software is used for multiple stepwise regression analysis of data to determine the causal relationship between variables and verify hypotheses. Durbin-Watson test (D-W test) and expansion factor VIF test were used to test whether the regression model was multicollinearity.

Establish regression models respectively: (1) external explicit and tacit knowledge acquisition as independent variables, enterprise performance as the dependent variable. (2) The four

processes of external knowledge transformation (KS, KE, KC, and KI) are independent variables, and enterprise performance is the dependent variable. (3-1) External knowledge acquisition is an independent variable, and external knowledge is transformed into a dependent variable. (3-2) Two kinds of knowledge acquisition approaches of external knowledge socialization (EK and TK) were taken as independent variables, and four processes of external knowledge transformation (KS, KE, KC, and KI) were taken as dependent variables to construct regression models of TK-KS, TK-KE, EK-KC, and EK-KI.

The DW test values of each regression model range from 1.610-1.956, and the values are close to 2, that is, the self-correlation of each random error term is low. The final regression coefficients and significance results of each model are shown in Table 2.

Table 2. Regression analysis table for each model

Models	Independent Variables	B	Beta	t	Sig.	Tolerance	VIF
KA-P	(Cons)	2.427		8.995	.000		
	EK	.315	.278	3.897	.000	.935	1.065
	TK	.233	.239	3.401	.007	.974	1.026
KT-P	(Cons)	1.401		4.896	.000		
	KS	.301	.339	5.298	.000	.595	1.609
	KE	.249	.318	4.813	.000	.575	1.751
	KI	.189	.223	3.721	.000	.536	1.812
KA-KT	(Cons)	1.895		8.891	.000		
	KA	.635	.607	5.298	.000	-	-
TK-KS	(Cons)	2.629		9.172	.000		
	TK	.337	.309	4.054	.000	-	-
TK-KE	(Cons)	2.483		8.879	.000		
	TK	.355	.343	6.114	.000	-	-
EK-KC	(Cons)	2.312		6.003	.000		
	EK	.216	.153	2.078	.035	-	-
EK-KI	(Cons)	2.979		10.871	.000		
	EK	.359	.282	3.956	.000	-	-

As can be seen from Table 2, the independent variables of each model, except for the external explicit knowledge acquisition T value of EK-KC, are less than 0.05, and the corresponding significance probability of other variables' T values is less than 0.01, so the obtained coefficients are statistically significant. Meanwhile, the VIF value of each variable is less than 10, close to 1, and has a high tolerance. So there is no multicollinearity between the independent variables.

Therefore, the regression analysis results show that: (1) there is a significant positive relationship between external knowledge acquisition and enterprise performance, assuming that H1a and H1b have been verified. (2) Knowledge socialization, externalization, and internalization in external knowledge transformation have significant positive effects on enterprise performance, assuming that H2a, H2b, and H2d are verified, but the independent variable "external knowledge combination" is eliminated in stepwise regression, assuming that H2C is not supported. (3) It is assumed that H3, H3a, H3b, H3c, and H2d have been verified. (4) As there is a significant positive relationship between external knowledge acquisition and enterprise performance, knowledge socialization, externalization, and internalization in external knowledge transformation have a significant positive impact on enterprise performance. And external knowledge acquisition has a significant positive influence on the knowledge transformation process. External tacit knowledge acquisition has a significant

positive influence on the process of knowledge socialization. External tacit knowledge acquisition has a significant positive influence on the process of knowledge externalization. External explicit knowledge acquisition has a significant positive effect on the process of knowledge implicit. But the independent variable "external knowledge combination" is eliminated in the stepwise regression. Thus hypotheses H4, H4a, H4b, and H4d are supported, but hypothesis H4c is not supported.

6. Conclusion

Based on the hypotheses of external knowledge acquisition, external knowledge transformation, and firm performance, this paper empirically analyzes the relationship between them. In the process of constructing a variable measurement system, full attention is paid to the test of scale reliability and validity. A questionnaire survey was conducted with a scale, and 219 samples of data were collected. SPSS 21.0 statistical software was used to verify the model and hypothesis. The empirical research results show that most of the hypotheses proposed in this paper have been verified, and further prove that enterprises need to strengthen the transformation of external knowledge after acquiring external knowledge to promote the improvement of enterprise performance, which has a certain guiding significance for the implementation of knowledge management strategy in the lightning protection industry.

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