

# **Factors of knowledge sharing in supply chain- based on perspective of knowledge characteristics**

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**Abstract:** The study investigates some influencing factors of supply chain knowledge sharing from the perspective of knowledge characteristics, and the variables' effects on supply chain knowledge sharing by empirical methods.

**Keywords:** Supply Chain, Knowledge Sharing, Influencing Factor, Knowledge Tacitness, SEM

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## **1. Introduction**

With the social and economic development patterns change and appearance of collaborative thoughts, there has been a great change in the competitive manner among enterprises, which leads to new approach of competition and management thoughts in the supply chain. Since information technologies mature, the information economy and the concept of the knowledge economy are more and more recognized. Nowadays, economic development model has emerged from the past era of relying on material resources. In this context the concept of knowledge management appeared, and knowledge management was not only implemented within internal enterprises, but also in the whole supply chain. So there was the fifth flow in the supply chain – knowledge flow. The key is the knowledge sharing among enterprises to achieve the smooth operation of knowledge flow. For these reasons, research on the mechanism and impact factors of knowledge sharing in supply chain is of great significance for the effective implementation of supply chain knowledge sharing.

## **2. Research Review**

Domestic and foreign scholars on knowledge sharing in the supply chain are mainly focused on two, one is competitiveness of the supply chain, and the other is the mechanism. In the aspect of enhancing the competitiveness, Wadhwa and Sacena(Wadhwa & Sacena, 2007) took Dennis FMCG (Fast Moving Consumer Goods) as research object, and put forward different nodal enterprise in supply chain can improve the development speed and quality of product by knowledge transferring and sharing. Mike Crone and Roper(Mike & Stephen,2001), from the angle of learning organization, studied the knowledge transferring and the supplier development in Northern Ireland multinational companies and local enterprises. The results proved the previous conclusion that knowledge transferring is significant positive to suppliers' development and improvement.

In the aspects of mechanism and influencing factors, Roper S etc.( Roper & Crone,2003) collected various data of knowledge sharing activities from 182 enterprises in supply chain network, through statistic and analysis, he drew the conclusion: the frequency of communication between enterprises influenced the level of knowledge sharing, the degree of knowledge tacitness affected the satisfaction of knowledge sharing between adjacent and partnership enterprises. Chanvarasuth (Chanvarasuth & Ravichandran,2003) noted that it was the lack of the absorptive capacity of knowledge receiver that caused knowledge viscosity, as well as the important factor which influenced the level of knowledge sharing in supply chain. The study summarized knowledge sharing research in supply chain, which was convenient for later scholars' research.

All the research mentioned above was vital significant to make effective mechanism of knowledge sharing in supply chain. This study research on the influence factors of knowledge sharing in supply chain- based on the perspective of knowledge characteristics. Meanwhile, in order to increase the accuracy of research, knowledge sharing study is divided into two dimensions: knowledge sharing effects and knowledge sharing behaviors.

### **3. Research Hypotheses**

#### **3.1 Knowledge Tacitness**

In 1958, British philosopher Polanyi was the first one who had studied the tacitness of knowledge from the angle of cognitive science, and classified the knowledge into articulate knowledge and tacit knowledge. The latter can be felt but not explained in words, and come from the individuals' perception, experience and understanding of the external world environment (Polanyi,1958).

Polanyi(Polanyi,1967) pointed out that the higher degree of tacit knowledge, the harder sharing, communication and exchange among members. Tacit knowledge could be well grasped, understood and appreciated only through the approach of "Learning from doing".

Tacit knowledge is not only the most important asset of enterprises, but also a source and power of corporate innovation. However, the sharing of tacit knowledge needs constant communication and exchange in each joint of supply chain, which will increase corresponding costs of knowledge sharing. Besides, if the supply-chain enterprises do not take effective measures to really understand and grasp tacit knowledge, it may lead to enormous risk, which will affect the operational efficiency and effectiveness of the entire supply chain. Supply-chain enterprises will tend to share explicit knowledge based on various considerations. Therefore, we propose the following hypotheses:

H1a: Knowledge tacitness has a negative impact on knowledge sharing behaviors in the supply chain.

H1b: Knowledge tacitness has a negative impact on knowledge sharing knowledge sharing effects in the supply chain.

### **3.2 Knowledge Embeddedness**

Any type of knowledge cannot exist in the free state, but in some form embedded in a carrier. Enterprise's knowledge mainly embedded in the three basic carriers, personnel, tool and mission. Because knowledge is not only embedded in personnel, tools and mission of each joint of supply chain, but embedded in the mutual cooperative relationship of each enterprise in the supply chain. Knowledge-sharing activities among supply chain enterprises are more complex and difficult than that within the individual enterprise. This embeddedness increases knowledge-transferring difficulties to varying degrees during the process of knowledge sharing, for the carriers in which knowledge embedded transfer as also in the process, which greatly increased the complexity of knowledge sharing. Accordingly, hypotheses H2a and H2b are as follows:

H2a: Knowledge embeddedness is negatively associated with knowledge sharing behaviors in the supply chain.

H2b: Knowledge embeddedness is negatively associated with knowledge sharing effects in the supply chain.

### **3.3 Knowledge Complexity**

The complexity of knowledge corresponds to the simple. Kogut and Zander(Kogut & Zander,1992) pointed out that the complexity of knowledge mean the amount of carriers, such as chart, language and words, which was needed in the process of knowledge sharing. By understanding the complexity of knowledge, we know that the more complex the knowledge, the more extensive the scope of knowledge, and the difficulty of the knowledge acquisition, knowledge transfer and knowledge sharing will increase, so knowledge sharing is more difficult. This is why people tend to share simple knowledge in the process of knowledge sharing. The simple knowledge sharing activities cost less time and energy, and sharing more easily can help them increase their self-confidence. However, learning and mastering complex knowledge is relative more difficult. Generally, the complexity of knowledge will increase of the difficulties of knowledge sharing, the cost of knowledge sharing, and improve requirements of the object knowledge transfer. Thus hypotheses H3a and H3b are as follows:

H3a: Knowledge complexity is negatively associated with knowledge sharing behaviors in the supply chain.

H3b: Knowledge complexity is negatively associated with knowledge sharing effects in the supply chain.

### **3.4 Knowledge Distance**

Most scholars believe that knowledge distance means the gap in the mastery of knowledge or skills between the knowledge providers and receivers. Hamel(Hamel,1991) held the point of that the distance between the knowledge providers and receivers could not be too large is an important condition for organizational learning occurring, because knowledge distance would increase the learning steps and the difficulty of learning, so as to produce a direct impact on the efficiency and effectiveness of knowledge transfer. Grant(Grant,1996) pointed out the purpose of organizational knowledge integration was to have the unique knowledge of different individuals reorganized, then created new knowledge which could create new value and bring in profits for organization. If the knowledge of the two individuals was completed unrelated, the integration of knowledge wouldn't produce the best result.

Each joint of supply chain is in different positions, and perform different functions in the supply chain process to, which determines their knowledge a certain degree of difference. However, in order to ensure each joint of supply chain can be a very good transfer of business knowledge and improve the efficiency and effectiveness of knowledge sharing, we must keep the knowledge

distance between each joint of supply chain not too large. Thus hypotheses H4a and H4b are as follows:

H4a: Knowledge distance is negatively associated with knowledge sharing behaviors in the supply chain.

H4b: Knowledge distance is negatively associated with knowledge sharing effects in the supply chain.

From the above, we construct the research model, as shown in Figure.1.

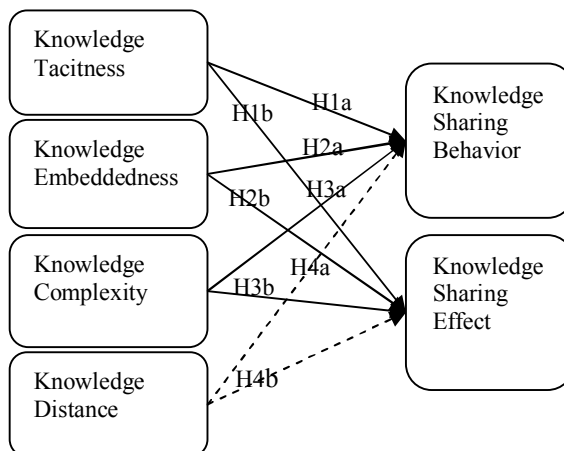


Fig. 1: Research Model

## 4. Scale Analysis and Hypothesis Testing

### 4.1 Collection of Questionnaire Design and Selection of Empirical Methods

A five-point Likert scale is used when we design the questionnaire, and test a small area sample which has a size of 60 to ensure the quality of the questionnaire. We adjust and correct these items of the questionnaire basing on the results from feedback to form a formal questionnaire. The subjects of this survey are the mid-high managers or the key employees who are working in the enterprises which had a history of supply chain collaboration, and these enterprises contain dozens of large state-owned enterprises and private enterprises who belong to dozens of different industries, which mainly touch upon the metal and mechanical engineering, chemistry and petrochemical engineering, building materials, electronic and electric apparatus and so on. In this survey, altogether 250 questionnaires are given out, 205 questionnaires were recovered, the recovery rate is 82 percent, and 199 questionnaires are

adopted for analysis. The research adopts SPSS17.0 software for data analysis of the samples and adopts Lisrel8.70 software for structural equation modeling.

## 4.2 Research Model and Hypothesis

### 4.2.1 The Research Model Test

After establishing the reliability and validity of variables, this paper use Lisrel8.7 software and maximum likelihood estimation method to calculate the model matching indices and the value of path coefficient estimates. Figure.2 shows the results.

The results of analysis show that the degree of freedom in this model is 195 and the value of chi-square is 412.94 and the ratio of chi-square with degrees of freedom is 2.12. The model fitting parameters of GFI, AGFI, CFI, NFI respectively is 0.89, 0.94, 0.93 and 0.87. All of these parameters meet the standard of greater than or close to 0.90 which were suggested by the relevant research of home and abroad. The root mean square error of approximation (RMSEA) is 0.063 and the root mean square residual (RMR) is 0.040, meeting the standard of less than 0.08. Therefore, the research model fit well with the data, so the model can be accepted.

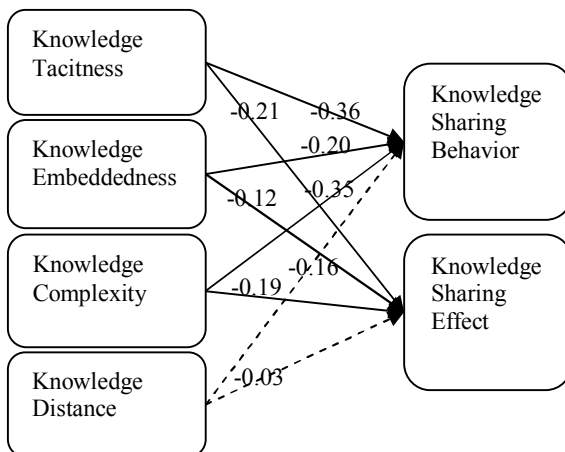


Fig. 2: Results of Structural Equation Analysis

### 4.2.2 Hypothesis Testing

The study use the significance of the path to test the hypothesis of this research, then make a summary (Table.1) of the hypothesis, estimates values of path coefficients, T values and results of testing.

Table1: Results of Hypothesis Testing

Hypothesis	Relations	Estimates values	T values	Results of testing
H1a	KT→KSB	-0.36	-2.58	support
H1b	KT→KSE	-0.21	-2.43	support
H2a	KE→KSB	-0.20	-1.98	support
H2b	KE→KSE	-0.12	-2.92	support
H3a	KC→KSB	-0.35	-2.44	support
H3b	KC→KSE	-0.19	-3.51	support
H4a	KD→KSB	0.16	-1.06	Not support
H4b	KD→KSE	-0.03	-0.78	Not support

According to above research, the analyses of the hypotheses are as follows:

1.The results show that H1a、H1b、H2a、H2b、H3a、H3b have been verified. That is to say, the knowledge tacitness、knowledge embeddedness and knowledge complexity will reduce the effects of knowledge sharing among supply chain members. So the hypotheses proposed previously have been confirmed. From the result we can see knowledge tacitness has the greatest negative impact on knowledge sharing, and next are the knowledge complexity and knowledge embeddedness. Among these factors' influence on the two dimensions of knowledge sharing, knowledge sharing behavior is affected even more. All the above provide a basis for us to develop effective knowledge management strategies.

2.The results show that both H4a and H4b have not been verified. So the hypothesis “knowledge distance has an impact on effects and behaviors of knowledge sharing between enterprises in supply chain” has not been confirmed. Possible reasons are as follows:

On the one hand, there is a great demand for knowledge. Informatization and international economic integration are outer factors which drive enterprises to implement knowledge sharing. Knowledge resources within the enterprises can't meet the needs of future development of enterprises and need to depend on external knowledge. Therefore, enterprises have to implement knowledge sharing to meet the demand for more knowledge, which force enterprises to look for partners.

On the other hand, compatibility of interest goals reduces the negative impact of knowledge distance on knowledge sharing. In order to respond to the changing external environment better, improve the response speed to market and reduce operating costs, entrepreneurs form supply chain alliances. During the process of knowledge sharing, though there is knowledge distance between the two enterprises, in order to achieve a common goal, the two sides will actively conduct knowledge sharing activities to achieve win-win results.

## 5. Conclusions

The research constructed a model about some influencing factors of supply chain knowledge sharing from the perspective of knowledge characteristics. The influencing factors of supply chain knowledge sharing include knowledge embeddedness, knowledge complexity and knowledge distance. Meanwhile, in order to increase the accuracy of research, knowledge sharing study is divided into two dimensions: knowledge sharing effects and knowledge sharing behaviors. From the analysis of the data collected, it has been showed most of the proposed hypotheses were validated. These conclusions also have proved some of the previous theoretical research. However, the hypothesis “knowledge distance has an impact on effects of knowledge sharing among supply chain members” has not been confirmed. By combining with the actual development situation of enterprises, we have given a reasonable explanation. In summary, the research has reached the expected goal.

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