

RESEARCH ON THE RELATIONSHIP BETWEEN INTELLECTUAL CAPITAL, SUPPLY CHAIN KNOWLEDGE SHARING AND ENTERPRISE INNOVATION ABILITY

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Abstract: Taking supply chain knowledge sharing as the intermediate variable, this paper constructs a conceptual model of intellectual capital's influence on enterprise innovation ability and explores its mechanism. Based on 288 questionnaires and structural equation models, the theoretical hypotheses are tested. The results show that: Three dimensions of intellectual capital, namely human capital, relational capital and structural capital, have a direct impact on knowledge sharing in supply chain and firm innovation ability. Knowledge sharing in supply chain plays an intermediary role in the impact of intellectual capital on firm innovation ability. Finally, on this basis, this paper gives some suggestions on how enterprises in the supply chain should promote their innovation ability through intellectual capital and knowledge sharing.

Keywords: Intellectual capital; Supply chain knowledge sharing; Innovation ability; Relationship research

1 INTRODUCTION

The innovation ability of enterprises directly drives the development of enterprises, regions and even the whole country at all levels. Economic growth is based on strong innovation ability. It is pointed out in the report of the 20th National Congress that adhering to innovation holds the core position in the overall situation of China's modernization drive. Faced with the increasing complexity and variability of the market environment, enterprises can only maintain their competitiveness by maintaining sufficient innovation. How to improve the innovation ability of enterprises has become an important issue for the survival and development of enterprises. With the coming of the era of knowledge economy, the improvement of intellectual capital and knowledge sharing among supply chain enterprises are the key to improve the innovation ability of enterprises. Intellectual capital with knowledge as the core has become an important strategic resource for enterprises to create value, and is the key factor for enterprises to obtain performance and competitive advantage. The improvement of organizational intellectual capital can make it stand out in the increasingly competitive market environment. Knowledge is an extremely important intangible asset of an enterprise. An enterprise has a wealth of knowledge and can constantly update and expand it, which has become a necessary condition for its foothold and development in the market competition. The core of innovation is the process of an enterprise constantly realizing knowledge accumulation. Supply chain knowledge sharing has a significant role in promoting the innovation ability of enterprises. From the perspective of knowledge management, the essence of enterprise innovation is knowledge innovation, and the smooth progress of innovation activities is essentially determined by the existing knowledge stock of enterprises. Only the efficient integration, utilization, absorption and creation of knowledge required for innovation can drive the opening of innovation activities. Therefore, it is of great theoretical and practical significance to explore the mechanism of intellectual capital and supply chain knowledge sharing on enterprise innovation ability and grasp the relationship among them for improving the innovation ability of nodal enterprises in the supply chain.

More and more enterprises begin to pay attention to the role of intellectual capital, and realize that intellectual capital has surpassed the importance of production capital and financial capital to some extent[1]. The knowledge acquisition of an organization depends on a certain intellectual capital, so the improvement of intellectual capital is particularly important for enterprises. Based on the characteristics of knowledge creativity, Ghosha et al. empirically-studied the impact of intellectual capital on knowledge sharing among enterprises, and found that the flexibility of organizational structure and the richness of network relations can promote knowledge sharing and innovation among enterprises[2].

By investigating the American medical equipment industry, Cheng et al. found that intellectual capital can promote enterprise innovation to a certain extent, but the correlation between them is not high[3]. Craighead et al. found through their research that organizational intellectual capital has a high degree of correlation with knowledge sharing, and the boundary between the two is fuzzy[4]. Knowledge enrichment guarantees the excellent performance of the supply chain, and the development degree of knowledge and intellectual capital level of the enterprise in the supply chain play a decisive role in the overall performance of the supply chain.

Enterprise innovation requires constant absorption of new knowledge, so only through the flow and sharing of knowledge can it exert its maximum utility and value. Knowledge sharing in supply chain belongs to the complex knowledge transfer process between organizations. Whether knowledge can flow smoothly in the supply chain plays a crucial role in promoting the improvement of organizational innovation ability. Almost all business activities of enterprises have to go through the process from knowledge acquisition, absorption, and then innovation[5]. Knowledge sharing in supply chain has become an important way for enterprises to obtain knowledge from outside. Through knowledge sharing activities, knowledge can flow among nodal enterprises in supply chain, connect knowledge islands

of member enterprises, optimize the allocation of knowledge resources, and promote the improvement of the overall competitiveness of supply chain[6]. Knowledge sharing can be divided into explicit knowledge sharing and invisible knowledge sharing. Explicit knowledge sharing can help enterprises obtain the technical rules and principles required for innovation, while invisible knowledge sharing can help enterprises obtain the technical know-how and professional experience required for innovation[7]. Hadaya believes that knowledge sharing among nodal enterprises in the supply chain can effectively reduce the learning time of repetitive knowledge, and play a significant role in speeding up the research and development process of new products and reducing research and development costs[8].

It can be seen that the research on the relationship between intellectual capital, supply chain knowledge sharing and enterprise innovation ability has become a hot topic of academic research at home and abroad, but there are still some problems worthy of further detailed research. For example, as an important intangible asset for enterprises to maintain competitive advantages, can organizational intellectual capital promote the improvement of enterprises' innovation ability? Supply chain knowledge sharing is an important channel for organizations to acquire external knowledge, can the improvement of intellectual capital promote the flow of knowledge in the supply chain? Whether intellectual capital indirectly affects the innovation ability of enterprises through the mediating role of knowledge sharing in supply chain? Through the above analysis, this paper mainly solves three research problems: first, build the relationship model among intellectual capital, supply chain knowledge sharing and enterprise innovation ability; Second, verify the relationship model between intellectual capital, supply chain knowledge sharing and enterprise innovation ability with the data obtained from the questionnaire; Third; Explore the mechanism of intellectual capital and supply chain knowledge sharing on enterprise innovation ability.

2 THEORETICAL REVIEW AND HYPOTHESIS

American economist John Kenneth Calbraith put forward the concept of intellectual capital for the first time in the 1960s. The reason for its emergence is that enterprises have explained the difference between market value and book value only by tangible assets. Therefore, intellectual capital is the sum of "intangible assets" owned by an enterprise, which can reflect the enterprise goal, reflect the enterprise competitive advantage and create the enterprise value. There are different ways to classify intellectual capital. Stewart et al. classified intellectual capital into three dimensions: Human capital, structural capital and relational capital, this classification method has been recognized by most scholars. This paper will also be based on this classification method, that is, intellectual capital includes human capital, relational capital and structural capital. Knowledge sharing in supply chain refers to the knowledge exchange among the supply chain member enterprises. It is the process of knowledge transfer from a single organization to multiple organizations. This process includes knowledge transfer, absorption, integration and application in the supply chain, which can improve the knowledge stock and quality of enterprises in the chain and build the knowledge advantage of the supply chain. The research of this paper will follow the above division of intellectual capital dimensions and the definition of supply chain knowledge sharing concept.

2.1 Relationship between Intellectual Capital and Knowledge Sharing in Supply Chain

Human capital generally refers to the knowledge or skills mastered by enterprise employees, including employees' educational background, work experience, business level and innovation ability. The prerequisite for efficient knowledge sharing among organizations is the ability, willingness and opportunity to share knowledge, which are closely related to the human capital within the organization. The process of knowledge sharing in supply chain cannot be completed without the cooperation of employees through their own knowledge, skills and experience. Therefore, Bontis et al. believe that human capital is an important asset for knowledge sharing among enterprises[9]. The improvement of human capital can lay a solid foundation for knowledge sharing among enterprises. The complexity of knowledge affects the effect of knowledge sharing, and the more complex the knowledge, the more difficult and costly the knowledge sharing will be. Hoopes and Zhang Zhenhong et al believe that the education level and work experience in human capital play a positive role in knowledge sharing among enterprises[10-11]. Liu and Chanvarasuth believe that employees' strong knowledge learning and absorption ability is conducive to promoting knowledge sharing among enterprises in the supply chain. [12-13] Hong et al proposed that the amount of professional knowledge of employees would affect their knowledge integration ability. The more professional knowledge of employees, the easier it is for enterprises to obtain knowledge from the outside, that is, the higher the efficiency of knowledge exchange between enterprises and the outside[14].

Relational capital refers to the interpersonal relationships formed by people's interaction and development over a period of time, such as trust, friendship, social support and recognition[15]. If an enterprise cannot establish good communication and exchanges with nodal enterprises in the supply chain, it is bound to be difficult to obtain effective knowledge shared by other enterprises. As a result, the internal knowledge of the enterprise cannot be updated in time, the competitive advantage of the enterprise is gradually lost, and the enterprise is abandoned by the supply chain. Trust among members of supply chain enterprises is an important embodiment of relational capital, and effective knowledge sharing in supply chain needs to be based on certain mutual trust. Lane believes that a good social interaction between enterprises is conducive to increasing the depth, breadth and effectiveness of the external knowledge acquired by enterprises[16]. Yeh and Cummings et al believe that long-term, stable and close cooperation relationship and effective communication can enable enterprises to obtain more effective knowledge and information resources[17-18]. Moreover,

a good relationship between enterprises can reduce the tendency of enterprises to protect knowledge in knowledge transfer to a certain extent, thus further improving the efficiency of knowledge sharing. It can be said that the higher the level of trust between enterprises, the higher the desire to cooperate with other enterprises, so that they are more willing to share knowledge with enterprises[19]. In addition, trust also helps reduce the psychological prevention in knowledge transfer and opportunism in enterprise cooperation. Kim believes that a long-term and stable cooperative relationship is the prerequisite for knowledge sharing among enterprises in the supply chain, and the attitude and behavior of nodal enterprises in the supply chain towards knowledge sharing determines whether knowledge can be exchanged from within enterprises to be shared outside enterprises [20].

The structural capital of an enterprise includes many factors such as organizational strategy, organizational culture, organizational structure, management system and information technology platform. For example, An Xiaofeng et al. found that media is very important for cross-enterprise knowledge sharing, and the establishment of sharing platform can provide technical support for knowledge sharing among supply chain enterprises[21]. Zhang Xumei, Feng Changli et al. believe that the unity between platforms will also affect the effect and cost of knowledge sharing among enterprises in the supply chain[22-23]. Similarly, the construction of information management system plays a positive role in promoting inter-organizational learning. Wang points out that a standardized organizational culture will promote knowledge sharing behavior, and an enterprise's internal culture will usually affect its external behavior. Enterprises with conservative culture tend to have low trust in other members of the supply chain, which will lead to the failure of knowledge transmission among enterprises in the supply chain nodes to improve the overall competitiveness of the supply chain[24]. In addition, the improvement of cooperation, supervision and incentive mechanism as well as the choice of communication channels can also promote knowledge sharing among enterprises in the supply chain. Based on the above analysis, this paper puts forward the following hypothesis:

H1a: Human capital has a positive impact on knowledge sharing in supply chain.

H1b: Relational capital has a positive and positive impact on knowledge sharing in supply chain.

H1c: Structural capital has a positive and positive impact on knowledge sharing in supply chain.

2.2 The Relationship between Intellectual Capital and Enterprise Innovation Ability

Human capital is the most difficult resource to be imitated by other enterprises, so human capital is the unique competitive advantage of enterprises. Lutz found through the investigation of German manufacturing enterprises that the educational background, work experience and work skills of employees directly determine the level of innovation performance of enterprises[25]. The more employees with high technical level of enterprises, the higher the number of employees, the higher the level of innovation performance of enterprises. The more employees, the higher the enthusiasm of the enterprise to carry out product innovation. Because human capital has the characteristics of creativity, skill and professionalism, it has become an important source of new ideas and new knowledge for organizations[26]. Galunic put forward that the realization of technological innovation needs the support of abundant human capital, which includes the knowledge level, skills and abilities of employees. Relationship capital mainly refers to the relationship of mutual trust and trust established between enterprises during long-term cooperation[27]. Wong et al. concluded that if an enterprise maintains a good relationship capital with its supply chain partners, the partners will take the initiative to improve product quality, thus promoting product innovation[28]. Through a survey of high-tech enterprises, Yli-Renko found that relationship capital can help enterprises obtain the desired external knowledge from key customers and promote enterprise innovation. Stable supplier partnership is conducive to improving the utilization rate of resources and promoting the innovation of production technology[29]. Good relationship capital can also promote the improvement of suppliers' innovation performance[30-31]. Good structural capital can realize the optimal allocation of enterprise resources through the coordination of corporate strategy, corporate culture and organizational structure, and promote the improvement of enterprise technological innovation and economic benefits[32]. Filieritakes Irish pharmaceutical enterprises as the research object, and finds that structural capital will positively promote the transfer and transformation of enterprise knowledge, thus promoting the development of enterprise innovation activities[33]. The leadership style in structural capital will also have an impact on the innovation ability of enterprises. Anderson found that inclusive leadership helps organizations maintain certain flexibility and stability, improve the operational efficiency of organizations, promote the reform of management methods and the optimization of organizational processes, and promote the innovation of enterprises[34].

Therefore, the intellectual capital of an enterprise has a positive correlation with the innovation ability of an enterprise, so the following hypothesis is proposed:

H2a: Human capital has a positive effect on firm innovation ability.

H2b: Relationship capital has a positive and positive impact on firm innovation capability.

H2c: Structural capital has a positive and positive impact on enterprise innovation ability.

2.3 Relationship between Supply Chain Knowledge Sharing and Enterprise Innovation Capability

Knowledge is an important resource for enterprises to develop and maintain competitive advantage. The key for enterprises to realize innovation lies in continuous acquisition and successful application of knowledge, and knowledge sharing enables enterprises to continuously acquire knowledge from outside enterprises, so that more resources can be invested in innovation. Jaff believes that innovation requires the process of knowledge learning and accumulation, and

the transfer of knowledge between enterprises is exactly in line with this feature. Therefore, the basis of innovation is the accumulation of knowledge in time[35]. Heide pointed out that an enterprise cannot possess all the knowledge needed for innovation, so it needs to continuously absorb and acquire knowledge from the outside of the enterprise to meet the needs of innovation activities. Knowledge sharing can help reduce R&D costs and improve the speed of product innovation[36]. Zhou and Subramaniam et al. found that timely exchange of knowledge and information between enterprises in the supply chain and their upstream and downstream enterprises is conducive to acquiring external knowledge and integrating it with the existing knowledge structure, thus improving the innovation capability of enterprises[37-38]. Only through knowledge sharing can static knowledge staying in various organizations flow dynamically between organizations, which is more conducive to knowledge integration and utilization and organizational innovation. Facts have proved that those enterprises with strong innovation ability are often the ones that can quickly absorb and utilize the external knowledge for innovation. Tsai's research found that knowledge sharing and transfer among organizations won more learning and cooperation opportunities for organization members, which helped organizations create new knowledge and enhance innovation ability[39]. In conclusion, knowledge sharing among enterprises in the supply chain can effectively promote the integration of external knowledge resources between enterprises and upstream and downstream enterprises in the supply chain, stimulate the inspiration of knowledge innovation of enterprises, and thus enhance the innovation ability of enterprises.

Therefore, the following hypotheses are proposed in this paper:

H3: Supply chain knowledge sharing has a positive impact on the innovation ability of enterprises.

2.4 The Mediating Effect of Knowledge Sharing in Supply Chain

For a long time, scholars have paid much attention to the direct effect of intellectual capital on enterprise innovation ability, but the mediating effect of knowledge sharing in supply chain between intellectual capital and enterprise innovation ability has not been paid enough attention. In fact, according to the above analysis, the improvement of organizational intellectual capital can promote knowledge sharing among enterprises in the supply chain, and knowledge sharing can promote the improvement of enterprises' innovation ability. Therefore, it can be inferred that intellectual capital can indirectly affect enterprises' innovation ability through knowledge sharing in the supply chain.

Studies have shown that inter-organizational learning ability plays an intermediary role in the effect of intellectual capital on the innovation performance of enterprises[40]. Moreover, the three dimensions of intellectual capital will also affect the innovation of an organization through knowledge management. Enterprises can realize knowledge innovation and shorten the innovation cycle by attaching importance to the investment of human capital, such as strengthening employees' learning and absorbing ability to the heterogeneous knowledge outside the organization. Meagher et al. found that close cooperative relationship in enterprise alliance is conducive to the occurrence of knowledge spillover effect, and promotes the knowledge absorption and innovation success of enterprises[41]. Baum et al. concluded that in the cooperation between enterprises, with the increase of the frequency of contacts between enterprises, that is, the improvement of relationship capital will significantly enhance the effect of knowledge sharing among enterprises, which will indirectly have a positive impact on the knowledge integration and innovation of enterprises, and improve the core competence of enterprises[42]. Mueller et al. found that a reasonable organizational culture can stimulate employees' creativity and passion for work, and make employees more willing to participate in knowledge sharing and innovation activities, thus improving organizational innovation performance[43].

Based on the above analysis, this paper holds that the improvement of intellectual capital within an organization can accelerate the flow of knowledge among enterprises in the supply chain, that is, promote knowledge sharing in the supply chain. At the same time, the strengthening of knowledge sharing among enterprises in the supply chain is also conducive to the continuous accumulation of knowledge needed for innovation, which has a positive impact on the improvement of innovation ability of enterprises. Therefore, the following hypothesis is proposed:

H4a: Knowledge sharing in supply chain plays an intermediary role between human capital and firm innovation ability.

H4b: Knowledge sharing in supply chain plays an intermediary role between structural capital and firm innovation capability.

H4c: Knowledge sharing in supply chain plays an intermediary role between relational capital and firm innovation capability.

Through the above analysis, we find that the three dimensions of intellectual capital, namely human capital, structural capital and relational capital, directly affect the innovation ability of enterprises. Moreover, the improvement of intellectual capital can effectively promote the knowledge sharing between upstream and downstream enterprises in the supply chain, and then through the flow of knowledge in the supply chain, improve the innovation ability of enterprises in the chain and promote the cooperation and win-win situation among enterprises in the supply chain. Therefore, according to the above logical relationship, this paper constructs the relationship model as shown in Figure 1, in which human capital, structural capital and relationship capital in intellectual capital are the dependent variables, knowledge sharing in supply chain is the intermediary variable, and enterprise innovation ability is the dependent variable.

Human capital, structural capital and relational capital are the dependent variables, knowledge sharing in supply chain is the intermediary variable, and innovation ability of enterprises is the dependent variable.

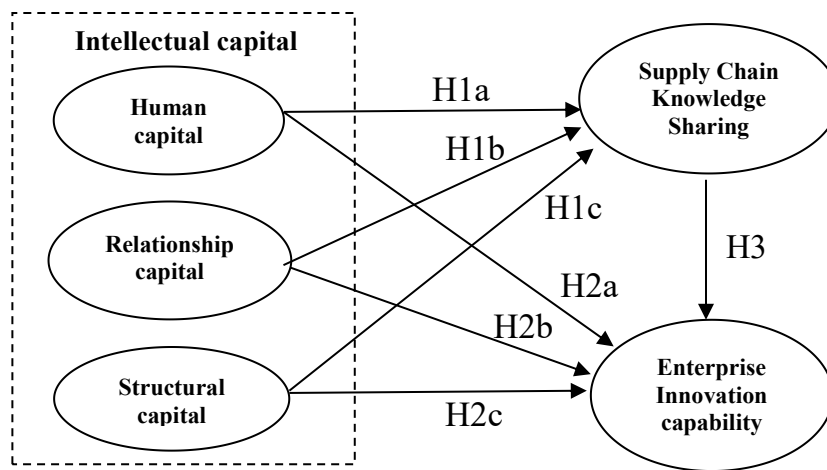


Figure 1: The Relationship Model between Intellectual Capital, Supply Chain Knowledge Sharing, and Enterprise Innovation Capability

3 DATA COLLECTION AND QUESTIONNAIRE DESIGN

3.1 Data Collection

In this study, part of the sample enterprises were randomly selected from the high-tech development zones in Yunnan, Guangdong and Anhui provinces, and the investigation was mainly conducted by telephone, E-mail, mail and door-to-door visits. A total of 500 questionnaires were sent out and 365 questionnaires were collected, accounting for 73% of the total. And 288 valid questionnaires, 78.9% of which were valid. The industries involved in the samples mainly included IT industry, new material industry, biomedicine industry, energy saving and environmental protection industry, electronic and electrical equipment industry and other industries. In order to ensure that the data obtained by the survey can truly reflect the actual situation of the enterprise, the respondents of this questionnaire are the business supervisor or department manager or above of the enterprise.

3.2 Questionnaire Design

The questionnaire measurement items in this study used a five-level Likert scale, with scores from 1 to 5 indicating "strongly disagree", "disagree", "uncertain", "agree" and "strongly agree". In order to ensure the reliability and validity of the model scale, the scales in this paper are selected from and refer to the mature scales in domestic and foreign literatures, and the scales are only adjusted appropriately according to the needs of actual research. Human capital mainly refers to the research of Youndt and Han et al., which includes five items[44-45]: Enterprise employees have received good education; Enterprise employees have rich working experience; The employees of the company have received good training; Employees are experts in their specific jobs and functions; Employees are constantly developing new knowledge and ideas. The relationship capital mainly refers to the research of Lv Feibao and Yang, including five items[46-47]: enterprises trust supply chain partners very much; Supply chain partners will try their best to help enterprises when they encounter difficulties; Supply chain partners will consider each other's interests when they act; Supply chain partners will not divulge each other's secrets; Reciprocity often occurs between companies and supply chain partners. Structural capital mainly refers to the research of Wang and Kamukama, which includes five questions[48-49]: the organizational structure of an enterprise is reasonable; The enterprise's overall business process is very efficient; The culture and atmosphere of the company is very flexible and comfortable; The company has easy access to information systems; The company's systems and processes support the development of R&D and innovation activities; The supply chain knowledge sharing mainly refers to the research of Feng Changli, which has 6 items[50]: enterprises and supply chain partners exchange a lot of knowledge related to product technology; Enterprises and supply chain partners to exchange a lot of knowledge related to production processes; Enterprises and supply chain partners to exchange a lot of management experience; Companies share a lot of marketing knowledge with supply chain partners; Companies and supply chain partners to exchange a lot of information about the latest development of the industry; Companies and supply chain partners share a lot of other aspects of knowledge needed by each other; The innovation ability of enterprises mainly refers to Song Zhihong's research, which has five items[51]: enterprises can launch new products or services faster than competitors; Enterprises can open up new markets faster than competitors; A firm can better control the source of supply of raw materials or semi-finished products than its competitors. They pay more attention to research and development than their competitors.

4 Research results

4.1 Reliability and Validity Analysis

After analyzing the questionnaire data with SPSS19.0, it was found that Cronbach's α value of each latent variable item was greater than 0.7, so the questionnaire had good reliability. At the same time, the measurement items used in this study were all selected from the mature research results of previous studies, so they had good content validity. KMO and Bartlett sphere tests were performed on the collected sample data, and it was found that the overall KMO value of the model was 0.927, and the significance probability was $0.000 < 0.001$, indicating that the data was suitable for factor analysis. Most of the factor load coefficients of the latent variables of the whole scale are above 0.7, the average variance extraction values AVE among latent variables are all greater than 0.5, and the square root of AVE is greater than the absolute value of Pearson correlation coefficients among latent variables. Therefore, it can be judged that all variables have good discriminant validity and are suitable for structural equation model analysis. The specific analysis results are shown in Table 1 and Table 2.

Table 1: Descriptive Statistics, Pearson Correlation Coefficient, and AVE Values

Latent Variables	Item	Standard factor load	Cronbach's alpha	Composite reliability	AVE
Human Capital (HC)	HC1	0.735	0.874	0.889	0.617
	HC2	0.746	0.871		
	HC3	0.805	0.861		
	HC4	0.827	0.854		
	HC5	0.809	0.859		
Relational capital (RC)	RC1	0.808	0.827	0.867	0.567
	RC2	0.763	0.836		
	RC3	0.728	0.844		
	RC4	0.739	0.843		
	RC5	0.725	0.844		
Structural capital (SC)	SC1	0.754	0.834	0.866	0.563
	SC2	0.744	0.839		
	SC3	0.727	0.841		
	SC4	0.755	0.837		
	SC5	0.77	0.835		
Supply Chain Knowledge Sharing (KS)	KS1	0.795	0.864	0.891	0.578
	KS2	0.732	0.875		
	KS3	0.83	0.860		
	KS4	0.736	0.875		
	KS5	0.739	0.873		
	KS6	0.723	0.877		
Enterprise Innovation capability(IA)	IA1	0.804	0.836	0.873	0.579
	IA2	0.732	0.851		
	IA3	0.764	0.844		
	IA4	0.759	0.847		
	IA5	0.742	0.849		

Table 2: Descriptive Statistics, Pearson Correlation Coefficient, and AVE Values

Research variables	M	SD	1	2	3	4	5
Human capital	3.0972	1.17429	0.785				
Relationship capital	2.6014	1.08625	0.255**	0.753			
structural capital	3.0931	1.09530	0.258**	0.349**	0.750		
Supply Chain Knowledge sharing	3.2037	1.11815	0.436**	0.393**	0.491 **	0.760	
Enterprise innovation ability	3.5514	1.00805	0.483 **	0.507**	0.517 **	0.541 **	0.761

Note: The square root of AVE on the diagonal and the correlation coefficient of each latent variable below the diagonal, ** indicates a significant correlation at the 0.01 level (bilateral)

4.2 Model Fitting Analysis

In this paper, AMOS 22.0 software was used to build a structural equation model, and the relevant hypotheses were empirically tested and the main fitting indexes of the model were analyzed, as shown in Table 3. It can be seen that the

fitting index values are less than 3, GFI, AGFI, CFI are all greater than 0.9, RMSEA is less than 0.05, and all fitting index values are analyzed within a reasonable range. χ^2/df It indicates that the overall fitting degree of the model is good.

Table 3: Model Fitting Index

Indicators	χ^2/df	GFI	AGFI	NFI	CFI	RMSEA
Model values	1.167	0.920	0.903	0.920	0.988	0.024

4.3 Hypothesis testing and Path Analysis

The path analysis results of the model are shown in Table 4. The analysis results of the structural equation model show that all the ten hypotheses proposed in this paper pass the test. Among the direct influences of intellectual capital on supply chain knowledge sharing, structural capital has the largest influence on supply chain knowledge sharing path coefficient, followed by human capital, and relational capital has the least influence on supply chain knowledge sharing. Among the three dimensions of intellectual capital, relational capital has the largest path coefficient, followed by structural capital, and human capital has the smallest.

Table 5: Shows the Path Coefficient of the Model

Assumptions	Paths	Coefficient	T-value	P	Hypothesis test result
H1a	Human Capital → Supply Chain knowledge sharing	0.340	5.126	***	Acceptance
H1b	Relationship Capital → Supply chain knowledge sharing	0.235	3.190	**	Acceptance
H1c	Structural Capital → Supply chain knowledge sharing	0.425	5.876	***	Acceptance
H2a	Human Capital → Enterprise innovation capability	0.273	4.797	***	Acceptance
H2b	Relationship capital → Corporate innovation capability	0.304	4.858	***	Acceptance
H2c	Structural capital → Corporate innovation capability	0.284	4.524	***	Acceptance

Note: *** means $p < 0.001$, ** means $p < 0.01$, and * means $p < 0.05$

The total influence coefficient of intellectual capital on enterprise innovation ability is shown in Table 5. The analysis shows that among the three dimensions of intellectual capital's influence on enterprise innovation ability, structural capital has the largest influence on enterprise innovation ability, followed by relational capital, and finally human capital.

Table 5: The Total Influence Coefficient of Intellectual Capital on Enterprise Innovation Ability

Paths	Direct impact	Indirect effects	Total effect
Human capital → Enterprise innovation ability	0.273	0.056	0.329
Relational capital → Enterprise innovation ability	0.304	0.036	0.340
Structural capital → Enterprise innovation ability	0.284	0.070	0.354

5 CONCLUSIONS AND SUGGESTIONS

5.1 Research Conclusion

Based on the intellectual capital theory, supply chain knowledge sharing theory and enterprise innovation ability theory, this paper constructs relevant research models and corresponding measurement scales from the perspective of knowledge interaction among enterprises in the supply chain and according to the research framework of "intellectual capital -- supply chain knowledge sharing -- enterprise innovation ability". Using 288 questionnaire data of supply

chain enterprises as samples, the structural equation model method is used to conduct hypothetical tests, and the influence of three dimensions of intellectual capital, human capital, relationship capital and structural capital on supply chain knowledge sharing and enterprise innovation ability is discussed, respectively. And the influence of these three dimensions on firms' innovation ability under the adjustment of the intermediary variable of knowledge sharing in supply chain. The results show that human capital, relational capital and structural capital in intellectual capital have significant positive effects on knowledge sharing in supply chain and firm innovation ability. Knowledge sharing in supply chain also has a significant positive impact on firms' innovation ability, and knowledge sharing in supply chain plays an important intermediary role between intellectual capital and firms' innovation ability.

5.2 Countermeasures and Suggestions

First, we should pay more attention to the promotion of enterprise intellectual capital. Through the research of this paper, it is found that the improvement of intellectual capital of the member enterprises in the supply chain is very beneficial to promote the knowledge sharing among the supply chain enterprises and the innovation ability of the member enterprises. Enterprises should strengthen intellectual capital from three aspects: human capital, relational capital and structural capital. In terms of human capital, enterprises should adapt to the changes of The Times, transform the former human resource concept into the current human capital concept, attach importance to the concept of human capital, and make human capital play a repeated role in the supply chain knowledge sharing and the improvement of enterprise innovation ability. Specifically, human capital can be improved by improving the education level of employees, paying attention to on-the-job training of employees, strengthening their competency and experience on the post, and cultivating their innovation consciousness. In terms of relationship capital, enterprises should establish mutual trust, respect and coordination interest relationship with suppliers, manufacturers, distributors and customers in the supply chain network in the long-term cooperation and exchanges, and form the unique relationship capital of supply chain enterprises, so as to bring advantages for knowledge sharing and enterprise innovation among enterprises. Specifically, the relationship capital with the supply chain partner enterprises can be maintained by strengthening mutual trust, taking the interests of the other side into consideration when acting, and reciprocal behavior. In terms of structural capital, enterprises should fully understand the importance of structural characteristics, and give full play to the social interaction and connection with external enterprises in the supply chain through various channels, which can be realized by strengthening the construction of organizational culture, improving the construction of information system, optimizing business process and promoting the rationalization of organizational structure.

Second, we should pay more attention to the knowledge sharing of supply chain. In China's implementation of innovation-driven development strategy and in the era of knowledge economy, the importance of knowledge has become increasingly prominent. With the increasingly fierce market competition, enterprises need to constantly obtain and absorb new knowledge from the outside to consolidate their advantages. Knowledge sharing among supply chain enterprises has become an important way to improve the innovation ability of enterprises in the chain and the overall competitiveness of the supply chain. The enterprises in the supply chain are closely connected, which is more convenient for knowledge dissemination and sharing. Through mutual exchange and learning, member enterprises in the supply chain can effectively integrate complementary knowledge, optimize their own knowledge structure, and realize the improvement of enterprise innovation ability. The emphasis on knowledge sharing among enterprises in the supply chain should be started from the following three aspects: one is to strengthen knowledge sharing between individuals in the supply chain, the other is to strengthen knowledge sharing within the organization in the supply chain, and the third is to promote knowledge sharing between enterprises in the supply chain. Enterprises in the supply chain can formulate corresponding incentive measures to actively encourage their employees to participate in knowledge sharing.

6 RESEARCH LIMITATIONS AND PROSPECTS

This paper collects variable data through questionnaire survey, which is largely influenced by the subjective factors of the respondents. Moreover, the sample size is limited and has strong regional characteristics, which will affect the final research results to some extent. In the follow-up research, it is planned to increase the number of samples and expand the regional scope of the survey in order to increase the credibility and representativeness of the data. In addition, it takes a long time to realize the formation of intellectual capital and knowledge sharing among enterprises in the supply chain, and the innovation ability of enterprises is unlikely to change significantly in a short period of time. The data obtained from the questionnaire is cross-section data with no time lag, which makes the research results have certain limitations. In future studies, we should try our best to solve the problem of time lag of variables, and we plan to use intertemporal time series data to make the research conclusions more reliable.

COMPETING INTERESTS

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