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Study on performance evaluation of knowledge alliance enterprise based on factor analysis

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Abstract. This paper presents a Conceptual model of knowledge alliance enterprise performance measurement which can provide scientific guidance for the enterprises to effectively conduct alliance cooperation and enhance alliance performance. Subsequently, questionnaires were distributed and retrieved, and the collected data were analyzed and dealt with through SPSS20.0 and Amos20.0. The conclusions are as follows: first, the social network subject and social network relationship play a positive role in improving the performance of knowledge alliance enterprises; second, alliance conflict and alliance satisfaction act as a fully mediated role between social networks and alliance performance; third, the knowledge alliance is a complete network form.The influence of willingness of netting on alliance conflict is obvious, and its negative correlation is fully verified.

Key words. Knowledge alliance, social network subject, social network relation.

1. Introduction

With the advent of the Internet economy, knowledge has become an important resource for enterprises to gain competitive advantage. The focus of the strategic alliance between enterprises turn to obtain knowledge resources that their own development lack of.More and more enterprises realize that the resource of single enterprise owned is not enough to make the enterprise standing out.in the fierce competition of globalization, only by cooperating with other enterprises and by means of sharing and integration of knowledge will they create new knowledge resources

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and form competitive advantage.As a result, the knowledge alliance between enterprises become a better way and the enterprises in the alliance form a complex social knowledge network.In this network, each enterprise becomes the node of knowledge inheritance, thus forming new network relationships which have different degrees impact on the role of knowledge alliance to play.Enterprise knowledge exchange between individuals formed the interdependent knowledge correlation and common code of conduct to enhance the degree of trust between enterprises and accelerate the spread of knowledge,bring some benefits for enterprise alliance to gain competitive advantage.However, companies must also see that the knowledge alliance is not so ideal because of its invisibility, complexity and implicit features.almost half of the alliance will be miscarry ultimately and failure rate is as high as 40%-70% according to related research.So it is necessary how to improve the performance of the alliance.

2. Related concept and connotation

2.1. Knowledge Alliance

knowledge alliance originated from Strategic alliance and it is the advanced form of knowledge alliance. The concept of strategic alliance was first proposed by J.Hopland,R.Nigel(1990). They believe that the strategic alliance is composed of two or more companies with the same interests, in order to achieve the strategic objectives of occupying the market, resource sharing and ultimately Improving the competition advantage.It is a loose network organization,which forms the risk sharing, complementary advantages and factors of production level bidirectional or multidirectional flow through agreement treaty. The new technological revolution makes the knowledge resources become an important strategic resource and core competence of an organization.The rise of enterprise knowledge alliance aimed to learn knowledge to strategic partners and strengthen enterprise competition ability conforms to the trend of knowledge economy,and the dominant form of enterprise competition is changing from product alliance to knowledge alliance.The definition of knowledge alliance put forward by Inkpen(1998) has been widely recognized by academic circles.He analyzed the purpose and content of the alliance from the perspective of knowledge and he pointed out that knowledge alliance is an alliance mode established by enterprise and enterprise or enterprises through scientific research institutions in order to carry on the knowledge transfer and knowledge sharing.The term of knowledge alliance,which is referred to by domestic scholars ,is mainly expressed in Learning alliance in the western literature.With further research of eastern and western scholars, the connotation of knowledge alliance has been improved and enriched.

The understanding on knowledge alliance from different research perspectives is also slightly different,by integrating the definition of many experts and scholars, this paper holds that the connotation of knowledge alliance contains at least four meanings:Firstly, as an advanced form of strategic alliance ,knowledge alliance aims to create and share knowledge in alliance enterprises; Secondly, the knowledge alliance is closer than the relationship between general partners, only by trusting each other

can they better for the creation of knowledge and improve their professional ability;Thirdly, the scope of cooperation is more extensive,and any company, scientific research institutions, colleges and universities can participate in as long as they have a unique professional skills and knowledge,contributing to the cooperation;Fourthly, more aggressive and strategic alliances, which Tend to develop new technologies and create new knowledge as a fundamental purpose, pay more attention to learning and knowledge innovation, thus gaining competitive advantages.

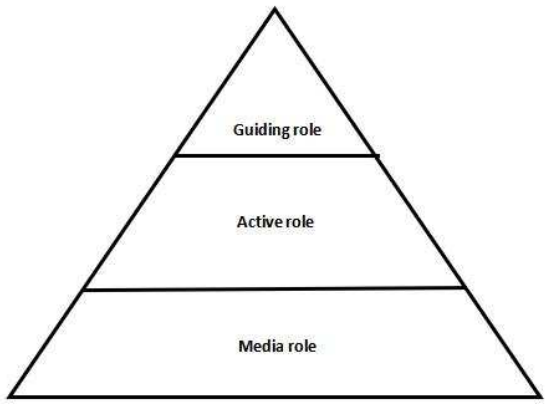

Fig. 1. The functional structure of knowledge alliance

The role of the knowledge alliance is just like a Pyramid, as shown in Figure 1.The media played a basic role in the bottom of Pyramid and laid a solid foundation for the knowledge alliance. Active role as the main body in the middle part of the pyramid, linkage media and guidance, to build a bridge for knowledge innovation. The guiding role is at the tip of the tower, providing direction and guidance for knowledge innovation.

Therefore, this paper defines knowledge alliance as: knowledge alliance is an advanced form of strategic alliance,but there are differences between both and it relies on different purpose.Knowledge alliance is a new organization form in order to acquire knowledge that derived from the other alliance enterprises, meanwhile getting inspiration in cooperation and creating knowledge independently.

2.2. The connotation of Social network

The concept of Social Networks was first proposed by the British anthropologist Brown (1940), then Mitchell (1969) defined the concept of social network ,which is defined as the unique relationship between specific individuals.In fact,the study of social networks has begun before the concept of social network was formally put forward. Alfred Radcliffe-Brown early put forward the concept of "social structure" and "network" in his book *Social organization of Australian tribes* in 1930, and he pointed out that the social structure is a complex network composed of social relations.Until 1960s, the concept of the network was gradually accepted and applied to various relevant social sciences research.In the late 80s, it got rapid development

and become a hot spot of research.

With the deepening of the research, the concept of social networks is no longer confined to the category of individuals, and participants of a network can be communities, companies and even nation or country.Wellman and Berkowitz (1988) pointed out that the relationship is not only including the contact connected participants,as well as including transaction relationship between associations and companies, such as leaders sharing, information, finance, and the flow of the members of the organization,and he defined the social structure as the network system. Ruan (1993) pointed out that the social system is a dependent relation network, and network members have differences between possession and structural distribution of these resources according to the different contact points. Yaping Xie (2016) pointed out that social networks provide resources to support entrepreneurs to learn, and these resources can be transformed into entrepreneurial skills through effective entrepreneurial learning, thereby enhancing entrepreneurial performance. And Lihua Wu, Jing Ji (2016) pointed out that Enterprises should continue to explore the relationship with other network members and take cooperation and innovative environmental management strategy.

According to the above definition of scholars, the paper find that the social network includes three key elements: Firstly, the premise of social formation is that there are difference occupying social resources;Secondly, the development of social network depends on the flow and sharing of information among members;Thirdly, the social network is a collection of social relations in essence.Therefore, this paper defines the social network as the different members of the position caused by the difference between the possession of resources in social system, through the connection of the relationship to flow the information, financial resources and organization members.

2.3. Related literature review on alliance conflict and alliance satisfaction

Researchers at home and abroad studied the conflict respectively from different angles,and Raven (1970) pointed out conflicts often arise from the ideal and reality reaction can not be able to merge to form the tension between the members of society.Thomas K (1976) defined conflict as a process in which one party perceives the other party intends or has already violated its own interests. DAS and Teng (2002) pointed out that the conflict produced in the situation of a conflict or some kind of contradictory to each other ,which causes the difference of perception in the situation. Shan Lin , Peilun Huang (2001) pointed out that the conflict often occurs between behavioral agents, and the reasons lie in that there are different ways of doing things and differences between the target , thus causes a confrontation between each other. Fumin Fan (2003) pointed out that the conflict is the subjective feeling of human beings, which comes from the incompatibility between the subjects. With the progress of the research,many scholars inclined to general conflict in the definition of conflict and its scope also changed the common opinions differ and the resulting differences from the previous fierce confrontation between the two sides to further expand the extension of the conflict.

In the knowledge alliance, because of the difference between the partners, it is easy to produce conflict, there is an inverse relationship between the difference and consensus, that is to say, the greater the difference, the less likely it is to reach a consensus.However, there is a relationship of interdependence among members of knowledge alliance, which makes it impossible for the members to ignore the differences between both sides, and it is precisely because of the existence of such differences that inevitably leading to differences between the two sides, so the conflict is the natural attributes of the alliance.Lingling Zhao (2008) pointed out that the differences of interests are the most fundamental cause of conflict with conflict economics as the breakthrough point. Liling Hu (2009) believed that the fundamental reason for the short cooperation targets and low efficiency of the cooperative mechanism lies in complex content of cooperation, incomplete protocol and so on, resulting in unclear responsibilities between members to conflict between members. however, conflict not only brings negative effects and some scholars put forward different views. Jun Yang et al. (2010) pointed out that cooperative conflict can bring discriminating experience to new team in a way, and then brings positive effect to the innovation of the product or service. Conflict is widespread and any organization can not avoid. Appropriate conflict can promote organizational reform and innovation to a certain extent and it has a positive effect to promote the development of the organization.

2.4. The connotation of alliance satisfaction

At present, scholars in the field of knowledge alliance have seldom studied from the perspective of alliance member satisfaction in the study of the alliance, so that this paper introduces customer satisfaction theory into the knowledge alliance, and then expounds the connotation of alliance satisfaction.In the 1950s, "customer satisfaction" as the academic concept rose in the theoretical circle, after decades of practice, it has been more and more organizations and customers recognized,and many experts and scholars define it from different angles, which is generally accepted view is: customer satisfaction is a subjective idea of consumers, which is based on the comparison between the hope state and the actual state of goods. Satisfaction is a psychological concept, which refers to the psychological state after the realization of individual needs.This state is the external material, the input of information make some people need to be satisfied to feel the psychological pleasure.

From the concept of "customer satisfaction",the paper thinks that the partners jointly form Lines of supply chain in knowledge alliance, Thus each individual member becomes a member of the supply chain, forming a relationship between the upstream and downstream. with other members.For such a relationship, the partners will evaluate the services or goods provided by the upstream, and alliance satisfaction can be used to evaluated the relationship,which is the response to the completion of the alliance objectives. From the above description, alliance satisfaction has two dimensions, one is the target dimension and the other is the process dimension.From the perspective of the relationship between the members of the alliance,the paper believes that satisfaction is a process, but also a kind of output, and it is a im-

portant aspect of the management of alliance member relationship. Satisfaction is an important basis for the evaluation of the relationship between members,but if the satisfaction as the final result to manage, it will lead to short-term alliance behavior, thus affecting internal resources effectively configuration.Behavioral indicators as the early warning device to response the long-term operation , if the satisfaction as a behavior, which seems to be more equitable and reasonable than the results oriented,but it must be pointed out that the lack of goals will be difficult to achieve the desired results and deviates from the goal of the management of membership.Therefore, when defining the alliance satisfaction, these two dimensions are indispensable, which is the unity of objective and process.

From the perspective of organization, enterprises form knowledge alliance for common desired objectives. Participants develop together in a virtual network and they must pay attention to the interests of the other party in order to obtain their own competitive advantage. As a kind of organizational form, when knowledge alliance evaluate member satisfaction, it can not just see the state of satisfaction that the alliance brings to a party, but should see the impact of all alliance partners on the whole. At the same time, the paper sees that the overall satisfaction is embodied by the individual satisfaction of the participants.This makes alliance satisfaction has two dimensions.one is the satisfaction of the individual; the other is the overall satisfaction of the alliance members. This paper studies the status of the second dimensions embodied by the status of the first dimension, but it needs to be emphasized the overall satisfaction of members is not a simple superposition of individual satisfaction.From the perspective of alliance satisfaction value, alliance satisfaction has significant influence on enterprise performance.The relationship between the two can be said to be the "source" and "flow" relationship, only to maintain good relations of cooperation and feel satisfied for cooperation in general , enterprises can achieve alliance goal and realize alliance performance.

2.5. The connotation of knowledge alliance performance

At present, there are different views on the definition of performance. The Ministry of finance's original statistical evaluation (2002) defines it as the operating efficiency of the enterprise and the operator's performance during a certain business.The level of operating efficiency is mainly reflected in the operating level, the ability to obtain income, the ability to take the debt and the ability to continue to develop.The operator's performance is the achievement and contribution of the individual who is the leader of the enterprise in the growth and expansion of the enterprise.Lixia Feng (2000) believed the enterprise performance has two dimensions. One is the result-oriented performance dimensions that the output records by the specific function and activity in a certain time; the other is the behavior-oriented performance dimensions,which is not only related to the enterprise policy but also can be measured according to the individual's ability. Rui Zhang (2003) pointed out performance is used to reflect the results of people engaged in activities. Subin wen (2005) ,who built the enterprise's triple performance model from three aspects of economic, social and ecological,made the enterprise performance evaluation is no

longer limited to the assessment of the financial and non-financial indicators , but he introduced the ecological, social and other higher level, broader perspective indexes to analysis the enterprise's business performance. Wei Peng, Liping Fu (2015) pointed out the alliance network has a significant positive impact on the performance of high-tech start-ups.

In conclusion,this paper argued that performance should include the content of "results" and "behavior"two dimensions,and both have different emphases that "grade" focus on results and "effect" just focus on behavior, so they can't be split but mixed in order to accurately evaluate the performance. Therefore,the enterprise performance is the result that a company use its resources to run at a specific time,which express in the "results" and "behavior" dimensions and also reflect in financial indicators such as return on investment, olvency and non-financial indicators such as customer satisfaction ,core-competitiveness.

3. The conceptual model and theoretical hypothesis

3.1. The conceptual model

Based on above analysis, it is easy to see that: firstly, there is little research on knowledge alliance from the perspective of social network at present;secondly,the influence of alliance satisfaction and alliance conflict on alliance performance is confirmed to some extent;thirdly,the relationship of social network subject and social network relationship to alliance satisfaction and alliance conflict is self-evident. Based on this,from the perspective of social network theory ,this paper tries to discuss how to improve the performance of knowledge alliance enterprises in the context of social network with a large number of individual members of the knowledge alliance as the research object.

On this basis,this paper puts forward a conceptual model of how social networks subject and social networks relationship affect the performance of knowledge alliance enterprises in the context of social networks, as shown in figure 2. The main characteristics of social network, including position centrality, heterogeneity and willingness of netting;Social network relationship includes information sharing, trust and connection strength.The main characteristics of social network and social network relationship make knowledge alliance subjects produce alliance conflict or alliance satisfaction in the process of cooperation, to some extent, this state has an impact on running performance of the alliance, which finally express in the duration of alliance and the ability promotion of alliance members.

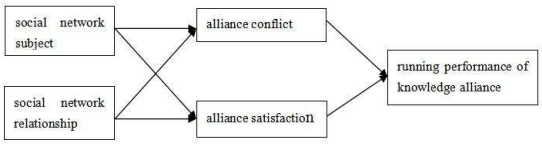

Fig. 2. Conceptual model of knowledge alliance enterprise performance measurement

3.2. The impact of conflict and satisfaction on alliance performance

The effect of different levels of alliance conflict on alliance performance is different, but it is clear that higher levels of alliance conflict will have negative effects on alliance performance.When alliance conflict develop to a certain height,organization members will produce strong tension,which will not only bring certain nervous to psychological perception of organization members, but also can bring huge coordination costs, affecting the level of income of members.In the high level of alliance conflict, the ability development of organization members will be limited, at the same time ,the existence of the alliance network will be affected. Many studies have found that higher level of alliance satisfaction has a positive impact on the relationship between members.Some scholars pointed out that alliance satisfaction can effectively reduce the tendency of organizational members to quit Alliance Network. Mohr and Jnevin (1990) through the analysis of the supply chain found that the suppliers will invest more resources in the knowledge alliance network, when they are satisfied with the current network,and the members of the organization can be more open to share information and knowledge to improve their ability due to alliance satisfaction. Therefore, this paper puts forward the following assumptions:

Hypothesis H1: higher level of alliance conflict has a negative impact on alliance performance;

Hypothesis H2: Alliance satisfaction has a positive impact on alliance performance.

3.3. The relationship between social network subject and alliance performance

(1)Position centrality

Knowledge alliance as a network organization, the power relationship among the members is one of the important relationships in the alliance.The higher position centrality of alliance members, the stronger the ability to acquire knowledge, information and resources.The purpose of alliance members to participate in knowledge alliance is to gain competitive advantages, including new knowledge and effective information. As an important channel of knowledge dissemination, the status of each node member is different, which determines the ability of enterprises to acquire knowledge resources.The higher the position centrality, the larger the scale of the network, the more linked enterprises,the more exchanged information and knowledge in the process of connecting with the enterprise.Tsai (2000) found that organizations in the center position compared to other companies are more likely to establish exchanged relationship with other organizations,so as to obtain new resources. Because of the large number of linked enterprises, the knowledge obtained is valuable and non redundant. In conclusion,for knowledge alliance enterprise,the higher the position centrality of alliance enterprise is, the greater likelihood of achieving its alliance, and the higher alliance satisfaction is.Therefore, this paper puts forward the following assumptions:

Hypothesis H3a: position centrality is helpful to reduce the conflict;

Hypothesis H3b: alliance conflict plays an intermediary role in the influence of position centrality on alliance performance;

Hypothesis H4a: position centrality has positive effect on alliance satisfaction;

Hypothesis H4b: alliance satisfaction plays an intermediary role in the influence of position centrality on alliance performance.

(2)Heterogeneity

In the network formed by knowledge alliance, the higher heterogeneity of the node enterprises, the higher the degree of diversification. All members play their ability in the alliance network, and cooperate with alliance enterprises, forming the network organization with multiple capabilities,in this way, and on the one hand the ability of enterprises to play, while on the other hand the ability of enterprises to develop.At the same time, enterprises can also gain advantages brought by alliance and have more competitive advantages compared with other enterprises outside the network. Due to the heterogeneity existence of the of the affiliated enterprises, the network can be well developed, and the scale is growing, affecting each other and promoting each other, so as to realize the strategic objectives of the alliance. Due to the existence of heterogeneity of inked enterprises, the network can be well developed, and the scale is growing, affecting each other and promoting each other, so as to realize the strategic objectives of alliance. In conclusion,for knowledge alliance enterprise,the higher the heterogeneity of alliance enterprise is, the greater likelihood of obtaining competition advantages to achieve goals, and the higher alliance satisfaction is. Therefore, this paper puts forward the following assumptions:

Hypothesis H5a: heterogeneity has a positive impact on alliance conflict;

Hypothesis H5b: alliance conflict plays an intermediary role in the influence of heterogeneity on alliance performance;

Hypothesis H6a: heterogeneity has a positive impact on alliance satisfaction;

Hypothesis H6b: alliance satisfaction plays an intermediary role in the influence of heterogeneity on alliance performance.

(3)Willingness of netting

When alliance enterprises have strong willingness of netting, the subjective psychological fluctuations can reduce the conflict of organization, making the node enterprises devote to cooperation, and then enhancing their ability.This is derived from the enterprise's own willingness of netting, the stronger the degree, the greater possibility of corporate access to collaborative cooperation, this time the stability of the alliance is relatively strong.s a result, the stronger willingness of netting of the firm, the stronger the foundation of the alliance, and the less likely it is that the alliance conflict will occur.

In conclusion,for knowledge alliance enterprise, the stronger willingness of netting of alliance enterprise is, the greater likelihood of achieving its alliance, and the higher alliance satisfaction is.Therefore, this paper puts forward the following assumptions;

Hypothesis H7a:willingness of netting has a negative impact on alliance conflict.

Hypothesis H7b: alliance conflict plays an intermediary role in the influence of willingness of netting on alliance performance;

Hypothesis H8a:willingness of netting has a positive influence on alliance satisfaction;

Hypothesis H8b: alliance satisfaction plays an intermediary role in the influence of willingness of netting on alliance performance.

3.4. The relationship between social network relationship and alliance performance

(1)Trust

In the social network of knowledge alliance, trust should occur more in the organizational level, which is the tendency degree of alliance members to trust the partners, and it is the response to the fair trade among the cooperative enterprises. As a key resource provided by the network, trust reflects the quality of alliance relations and becomes a key factor in the development of the alliance.Dore (1983) pointed out that trust makes the organization open to partners, enhance the willingness of partners to provide new knowledge, and make better use of each other's resources. Through the trust, knowledge alliance subject can enhance its own capacity while increasing the persistent of the alliance.

To sum up, trust can effectively improve the satisfaction of alliance members, and has the possibility of reducing the alliance conflict, thereby enhancing the alliance performance.Therefore, this paper puts forward the following assumptions:

Hypothesis H9a: trust has a negative influence on alliance conflict;

Hypothesis H9b: alliance conflict plays an intermediary role in the influence of trust on alliance performance;

Hypothesis H10a: trust has a positive impact on alliance satisfaction;

Hypothesis H10b: alliance satisfaction plays an intermediary role in the influence of trust on alliance performance.

(2)Connection strength

In the fierce competitive environment, it is important to maintain good relations of cooperation, especially the enterprises in the knowledge alliance network.To strengthen the link between partners and get close relationship, which can effectively reduce the uncertainty of transaction cost and expected benefit, making both sides obtain satisfaction,and the existence of intimate relationships can effectively reduce the occurrence of conflict.In summary, the greater the connection strength, the more able to enhance alliance satisfaction of the members, and reduce the possibility of alliance conflict, thereby enhancing the alliance performance.Therefore, this paper puts forward the following assumptions:

Hypothesis H11a: strong connection has a negative influence on alliance conflict;

Hypothesis H11b: alliance conflict plays an intermediary role in the influence of connection strength on alliance performance;

Hypothesis H12a: strong connection has a positive effect on alliance satisfaction;

Hypothesis H12b:alliance satisfaction plays an intermediary role in the influence of connection strength on alliance performance.

(3)Information sharing

In the alliance network, sharing information publicly can deepen the alliance members' commitment to each other, for example, tacit knowledge, market technology and other information exchange, sharing, can deepen the understanding between

members, enhance their commitment,strengthen the degree of mutual trust.The subjects of alliance network through formal and informal channels of communication establish social relations and enhance the tacit understanding among partners ,making it easy to obtain alliance satisfaction.In addition, timely information sharing can effectively solve the disputes between the alliance members, eliminate the differences, and enhance the trust between the two sides, which effectively reduce the possibility of alliance conflict.To sum up, the information sharing can improve the alliance satisfaction of members, and has the possibility of reducing the alliance conflict, which can improve alliance performance.Therefore, this paper puts forward the following assumptions:

Hypothesis H13a: information sharing has a negative influence on alliance conflict;

Hypothesis H13b: alliance conflict plays an intermediary role in the influence of information sharing on alliance performance;

Hypothesis H14a: information sharing has a positive influence on alliance satisfaction;

Hypothesis H14b: alliance satisfaction plays an intermediary role in the influence of information sharing on alliance performance.

4. Research method and model checking

4.1. Questionnaire design and data collection

This paper researched social network, alliance satisfaction and alliance conflict, alliances performance. some indicators can not be obtained directly from the existing data, and they were collected by means of questionnaire. According to the previous research results, the paper solicited the opinions of the relevant experts, designed the questionnaire combined with the enterprise actual interviews, and carried out the empirical research through the procedure of distribution, collection, entry, and analysis.

4.2. Variable measurement

The paper studied a total of nine variables - social network subject variables (position centrality, heterogeneity, willingness of netting), social network relationship variables(trust,connection strength, information sharing) and alliance conflict, alliance satisfaction and alliance performance.Through sorting out relevant literature, this paper formed the title.

4.3. Large sample investigation data analysis and checking

(1) Descriptive statistical analysis

In order to ensure that the sample data meet the requirements of statistical analysis, in this part, the paper carries on the descriptive analysis of each variable, mainly from the mean, standard deviation, skewness and kurtosis. As shown in

Table 1, the mean values of the variables in the sample of this study are evenly distributed, the standard deviation is between 0.5 and 1.3, and the dispersion is not significant;The absolute value of skewness is less than 3, and the absolute value of kurtosis is less than 10, so the sample data basically obey the normal distribution, which is suitable for further analysis.

Table 1. Descriptive statistics for each variable

Variable	Item	Mean	Standard deviation	Skewness	Kurtosis
Alliance performance	Q11	3.36	1.086	-.488	-.224
	Q12	3.39	.972	-.399	-.125
	Q13	3.25	.919	-.042	-.302
	Q14	3.17	.978	-.480	-.076
	Q15	3.39	.927	-.385	-.306
	Q16	3.52	.989	-.464	-.357
Position centrality	Q21	3.48	1.024	-.642	-.083
	Q22	3.25	1.008	-.301	-.299
	Q23	3.35	.970	-.257	-.216
	Q24	3.27	1.021	-.373	-.354
Heterogeneity	Q31	3.25	1.084	-.265	-.635
	Q32	3.17	1.004	-.299	-.227
	Q33	3.26	1.022	-.510	-.180
Willingness of netting	Q41	3.35	.997	-.393	-.390
	Q42	3.52	1.020	-.634	.038
	Q43	3.39	1.044	-.359	-.349
Trust	Q51	3.57	1.059	-.658	-.173
	Q52	3.39	1.018	-.364	-.332
	Q53	3.60	1.022	-.511	-.211
Connection strength	Q61	3.36	1.040	-.453	-.271
	Q62	3.35	1.153	-.260	-.328
	Q63	3.38	1.095	-.318	-.379
Information sharing	Q71	3.27	.987	-.138	-.852
	Q72	3.30	.987	-.203	-.691
	Q73	3.30	1.001	-.118	-.598
Alliance conflict	Q81	3.46	.958	-.283	-.642
	Q82	3.54	.980	-.067	-.422
	Q83	3.37	1.027	-.022	-.310
Alliance satisfaction	Q91	3.46	1.089	-.151	-.575
	Q92	3.52	1.018	-.045	-.640
	Q93	3.41	.947	-.419	-.505

(2) Reliability test

This section tests the reliability of large sample data, which is consistent with the

pre-survey test method, using Cronbach's a coefficient method to test the internal consistency of the data.The results of the test are shown in Table 2.

Table 2. Reliability analysis of formal questionnaire scale

Variable	Number of measurement indicators	Cronbach's a coefficient	Reliability level
Alliance performance	6	0.818	high
Position centrality	4	0.859	high
Heterogeneity	3	0.846	high
Willingness of netting	3	0.856	high
Trust	3	0.806	high
Connection strength	3	0.848	high
Information sharing	3	0.853	high
Alliance conflict	3	0.894	high
Alliance satisfaction	3	0.874	high
Questionnaire overall	31	0.903	very high

From Table 2, the Cronbach's a coefficient of every variable measure item is higher than 0.8, indicating that the scale has a high degree of internal consistency, and the Cronbach's a coefficient of the whole questionnaire reaches 0.9,indicating that the questionnaire has a very high reliability level , which can meet the stability requirements of the questionnaire in this study.

(3) Validity test

Validity refers to the measure used to measure the extent to which the researcher is to measure things, and is an important prerequisite for ensuring the accuracy of the measurement structure. There are three types of validity, namely, content validity, construct validity and criterion correlation validity. This paper evaluates from the two levels of content validity and construct validity

1) Exploratory factor analysis

Exploratory factor analysis pays more attention to the determination of the number of factors, which can change numerous for brief.In order to extract the influence of social network subject and relationship on alliance conflict and alliance satisfaction,then the relationship between the alliance performance. This paper use the method to test the validity of large sample data in this paper.The specific steps are as follows:

First of all, KMO sample measurement and Bartlett sphere test were performed using SPSS 20.0 software to determine whether factor analysis could be performed.It is generally considered that the effect of factor analysis is better when KMO is larger than 0.7, and KMO less than 0.5 can not carry out factor analysis; The Bartlett Sphere test results are significantly on the 0.05 level. The results of the applicability test are shown in Table 3, with the KMO value of 0.743 more than 0.70 and less

than 0.80;The Bartlett spherical test is significantly at the 0.000 level, which is less than the given 0.05 significance level, so it is suitable for exploratory factor analysis.

Table 3. Testing of KMO and Bartlett

KMO measure		.743
Bartlett's spherical test	Approximate chi-square value	912.548
	Degrees of freedom	279
	Significance level	.000

The results of exploratory factor analysis are shown in Table 4, and seven factors are extracted from 31 measure items. Among them, Q11, Q12, Q13, Q14, Q15 and Q16 have higher load on the first factor, corresponding to the alliance performance elements.Q21, Q22, Q23, Q24 have higher load on the second factor, which corresponds to the position centrality elements.Q31, Q32, Q33 have higher load on the third factor, which corresponds to the heterogeneous elements.Q41, Q42, Q43 have higher load on the forth factor, which corresponds to the willingness of netting elements. Q51, Q52, Q53 have higher load on the fifth factor, which corresponds to the trust elements. Q61, Q62 and Q63 have higher load on the sixth factor,which corresponds to the connection strength elements. Q71, Q72 and Q73 have higher load on the seventh factor, which corresponds to the information sharing elements. Q81, Q82 and Q83 have higher load on the eighth factor, corresponding to the alliance conflict elements. And Q91, Q92, and Q93 have higher load on the ninth factor, the corresponding to the satisfaction alliance elements.

In addition, it can be seen from table 4 that the load value of each item in the corresponding factor is 0.643, more than 0.5, and the cumulative explained variance contribution rate of all factors is 77.249%, which is consistent with the setting of variable structure. It shows that there is a relatively high convergence validity.At the same time, the related items of each variable are attributed to a factor, and the correlation with other variables is 0, indicating that there is a certain discriminant validity. Through the exploratory factor analysis, the scale used in this study has a good construct validity.

Table 4. Exploratory factor analysis results

Variable	Item			Ingredients						
		1	2	3	4	5	6	7	8	9
Alliance performance	Q11	.814								
	Q12	.811								
	Q13	.730								
	Q14	.664								
	Q15	.722								
	Q16	.802								
Position centrality	Q21		.823							
	Q22		.796							
	Q23		.732							
Heterogeneity	Q31			.880						
	Q32			.871						
	Q33			.839						
Willingness of netting	Q41				.847					
	Q42				.813					
	Q43				.797					
Trust	Q51					.833				
	Q52					.782				
	Q53					.730				
Connection strength	Q61						.862			
	Q62						.800			
	Q63						.793			
Information sharing	Q71							.757		
	Q72							.789		
	Q73							.643		
Alliance conflict	Q81								.729	
	Q82								.753	
	Q83								.741	
Alliance satisfaction	Q91									.727
	Q92									.739
	Q93									.702
Eigenvalues		4.4433	3.396	2.607	1.989	1.586	1.377	1.009	2.012	2.607
Explain variance		19.319	14.765	11.336	8.647	6.896	5.985	4.386	3.343	2.572
Cumulative explanation variance		19.319	34.084	45.420	54.067	60.963	66.948	71.334	74.677	77.249

2) Confirmatory factor analysis

Based on the exploratory factor analysis, the validation factor analysis of the model was carried out by using AMOS 20.0 software to observe the structural relation between the item and the variable and the degree of fitting of the data , further to ensure the convergence validity of the structure. The results of the model fitting are shown in Table 5, and the indexes reach the acceptable level.The fitting condition is good and the convergence validity of the structure is higher.

Table 5. Fitting results of measurement model

Fit index	Measurement model	Fit condition
Chi-square value of model absolute fitting parameters	294.625	
Degree of freedom	209	
Chi-square / degree of freedom	1.410	Less than 2, fit well
Goodness Fit Index(GFI)	0.923	More than 0.9, fit well
Parsimony Goodness Fit Index(PGFI)	0.699	More than 0.5, ideal
Relative Fit Index(RFI)	0.924	More than 0.9, fit well
Comparative Fit Index(CFI)	0.976	More than 0.9, fit well
Tucker - Lewis Index(TLI)	0.971	More than 0.9, fit well
Incremental Correction Index(ICI)	0.976	More than 0.9, fit well
Root Mean Square Error of Approximation(RMSEA)	0.037	Less than 0.05, fit well

For the test of discriminant validity, this paper evaluated the correlation coefficient between the variables and the AVE square root. If the AVE square root is larger than the correlation coefficient between the variables, it shows the discriminant validity. The structure of this paper conforms to the standard of judgment, and there is a significant difference between the variables. The structure of this paper has high discriminant validity.

In this paper, the significance level $p<0.05$ and the standardized path coefficient as positive value are the main basis to determine the path relationship.When the significance level $p<0.05$, the hypothesis pass the test of significance. When the standardized path coefficient is positive, the direction of the study is the same as the verification result. When the above two test results appear simultaneously, it can be explained that the path assumption is true.From the point of view of structural equation model calculation results, in addition to “heterogeneity $\rightarrow$ alliance conflict ”, assuming that the significance level of the path is less than 0.05, that is to say that these assumptions are supported at the significance level of 0.05, and the standardized coefficient of each path is positive. This research hypothesis path direction is consistent with the verification result. While the standardized coefficient of "heterogeneity $\rightarrow$ alliance conflict" is negative and its significance level is 0.707 higher than 0.05, indicating that the positive correlation of the path is not significant.In summary, in addition to "heterogeneity $\rightarrow$ alliance conflict", the other path direc-

tion of the model is consistent with the hypothesis and significantly supported, and each path is a reasonable from the practical considerations.

Table 6. Structural equation model path coefficient

Path relationship	Standardized coefficient	S.E.	C.R.	P
Alliance performance<—Alliance conflict	.427	0.60	4.934	***
Alliance performance<—Alliance satisfaction	.301	.101	4.328	***
Alliance conflict<—Position centrality	.218	.078	3.393	***
Alliance satisfaction<—Position centrality	.263	.082	3.885	***
Alliance conflict<—Heterogeneity	**-.024**	**.039**	**-.376**	**.707**
Alliance satisfaction<—Heterogeneity	.281	.090	4.026	***
Alliance conflict<—Willingness of netting	.499	.081	6.654	***
Alliance satisfaction<—Willingness of netting	.291	.075	4.204	***
Alliance conflict<—Trust	.263	.068	3.794	***
Alliance satisfaction<—Trust	.179	.080	2.806	***
Alliance conflict<—Connection strength	.275	.079	4.007	***
Alliance satisfaction<—Connection strength	.286	.089	4.167	***
Alliance conflict<—Information sharing	.315	.039	4.316	***
Alliance satisfaction<—Information sharing	.203	.070	3.250	***

Note: *** indicates significance level P <0.001

5. Conclusion

Based on the literature review, this paper constructs a model of the impact of the social network subject and social network relationship on the alliance performance based on social network theory. Through the empirical research on the sample data of 237 target companies, the paper verifies the influence mechanism of each dimension of social network subject and social network relationship on the alliance performance.The conclusions are as follows:

The social network subject and social network relationship play a positive role in improving the performance of knowledge alliance enterprises. This paper proves that position centrality, heterogeneity and willingness of netting can promote the alliance performance by constructing a performance mechanism model of enterprise alliance enterprises based on social network. It also proves that trust, connection strength and information sharing have a good impact on the performance of knowledge alliance.These show that the social network plays a very important role in the knowledge alliance enterprises, and plays a catalytic role in promoting the performance of enterprises.

Alliance conflict and alliance satisfaction act as a fully mediated role between social networks and alliance performance. The social network subject and social network relationship are not directly related to the performance of the knowledge alliance, but first acted on the alliance conflict and alliance satisfaction, and then the two complete mediation of alliance conflict and alliance satisfaction indirectly promote performance improvement of the knowledge alliance.

Through the analysis of the social network of the knowledge alliance enterprises, it is concluded that the knowledge alliance is a complete network form, which is close to the outside world.The influence of willingness of netting on alliance conflict is obvious, and its negative correlation is fully verified.In addition, information sharing is the most prerequisite for the formation of knowledge alliance, and plays a very important role in achieving the goal of alliance and improving the performance of enterprise alliance.

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