Exploring The Relationship Between Partner Heterogeneity And Business Model Innovation: The Mediating Effect Of Knowledge Transfer

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Abstract. Designing novel and unique business model is an important means for enterprises to obtain competitive advantages. Business model innovation is beneficial for enterprises to obtain new market resources and find new economic growth points. In an open network, companies need to establish business models with different partners, but which partners are more conducive to innovation and further research is needed. Therefore, this paper establishes a theoretical model, theoretically analyzes the relationship between "partner heterogeneity and business model innovation", and tests the hypothesis through data from 386 valid samples. It demonstrate that (1) partner heterogeneity has a positive relationship with business model innovation, the heterogeneity of the partners is more conducive to innovation (2)there is a significantly positive relationship between knowledge transfer and business model innovation, and knowledge transfer activities can effectively make up the knowledge gap between enterprises and their partners (3)knowledge transfer plays an intermediary role between partner heterogeneity and business model innovation, and is a cooperative way for enterprises and partners to jointly carry out business model innovation.

1. Introduction

More and more companies gain competitive advantage through business model innovation. IBM's service revenues account for more than 50%, and have moved from manufacturers to service providers, from product manufacturers to knowledge integrators. By launching the combination of "iPod + iTunes+iPhone", apple innovatively transformed itself from product operator to platform enterprise and realized the occupation of global communication market. First, the boundary is fuzzy. That is to say, the business model innovation is the open innovation completed by the participation of multiple parties, and the crisscross business network is the ecological environment of the business model innovation. The second, it is needed carry out the knowledge transfer between companies and partners, the partners need to focus the enterprise business model innovation needed complementary knowledge, realize the timely adjustment of existing business model, even refactoring[1], especially in the Internet age, the knowledge information updates fast, fail to achieve business model innovation for enterprises is extremely deadly.

However, at the research level, although existing research emphasizes that business model innovation needs to cooperate with partners in an open network[2-3], there is still an in-depth study on what kind of partners to cooperate with and how to cooperate.Therefore, in the process of business model innovation, enterprises must also answer the following questions: who to cooperate with, why to cooperate with, what characteristics the partners should have, and through what forms of cooperation. For these problems, it is necessary to make further discussion and analysis.

On this basis, through literature review, it is believed that when enterprises are innovating business models, choosing heterogeneous partners is most beneficial to the innovation practice of

enterprises, especially in the era of knowledge economy, through knowledge transfer activities with heterogeneous partners, most effectively promote business model innovation. Therefore, this paper explores the role of partner heterogeneity and knowledge transfer in business model innovation, and builds a theoretical model based on this, through empirical analysis and verification, for enterprise business model innovation.

2. Theory and hypothesis

2.1. Partner heterogeneity and business model innovation

Based on the view of resource dependence and taking the subject and object as dimension rulers, this study divides partner heterogeneity into organizational heterogeneity and knowledge heterogeneity[4].Among them, organizational heterogeneity reflects the differences in the types of organization and the degree of diversity of different partners in terms of partner heterogeneity. Knowledge heterogeneity mainly reflects the knowledge difference and complementarity between different subjects, and emphasizes the role of heterogeneous knowledge in promoting innovation.

Organizational heterogeneity of partnership heterogeneity offers the possibility for companies to collaborate to achieve business model innovation. In business model innovation, companies can choose various organizations as partners. These partners can be users, university research institutions, government agencies, technology intermediaries, and venture capital institutions[5-7]. Different partners play different roles in business model innovation due to varying degrees. Diversification of organizational types is the basis for business model innovation. Regardless of the business model innovation, it is an open innovation activity carried out by key enterprises and network partners. A large number of studies have shown that it is precisely because of the existence of organizational heterogeneity that each other presents a diversified state in terms of business philosophy, resource allocation, and strategic goals. Colleges and enterprises can effectively cooperate and successfully transfer new technologies. New processes, new methods[8-9], to achieve business model innovation.

In addition, the heterogeneity of knowledge in the heterogeneity of partnerships provides the basis for business model innovation. The differentiation and complementarity of knowledge provides the possibility of combining multiple kinds of knowledge[10]. Heterogeneous knowledge has nurtured new ideas and provided more opportunities for business model innovation[11]. From a knowledge point of view, an enterprise is essentially a collection of various knowledge, and different sets of knowledge contain different elements. Heterogeneous knowledge can make up for the knowledge gap of enterprises[12], and ultimately can promote the improvement of enterprise innovation ability[13]. In most scholars' research, complementary or heterogeneous knowledge can significantly improve innovation performance[14]. The business model is presented not only as a system structure but also as a novel concept[15]. Heterogeneous knowledge is often the best breeding ground for new ideas. When different types of knowledge are rearranged, it often overturns existing business logic and rules with unprecedented concepts. Therefore, this study proposes the following assumptions:

H1a: organizational heterogeneity has a positive relationship with business model innovation.

H1b: knowledge heterogeneity has a positive relationship with business model innovation.

2.2. Knowledge transfer and business model innovation

Knowledge is an important basis for business model innovation, but knowledge in a static state does not directly cause business model innovation. Therefore, knowledge transfer is an important factor directly causing business model innovation[16-17]. As a dynamic process, the goal of knowledge transfer is not the simple flow of knowledge among subjects, but how it can be applied, integrated and reconstructed to produce new values[18-20]. Therefore, knowledge transfer refers to the process in which knowledge is transferred, absorbed, Shared, applied and finally embedded into the internal situation of an organization among different subjects. The purpose of knowledge transfer is to improve cooperative performance and promote cooperative innovation.

From the perspective of organizational learning theory, innovation is a process of continuous learning, a process of acquiring knowledge, creating knowledge, and accumulating knowledge. Through knowledge transfer, companies can acquire relevant knowledge and information from users, companies (suppliers, competitors) in the industry, and creatively use and integrate them to increase the likelihood of success. Business model innovation[21-22]. In particular, with the continuous development of the concept of open cooperation and innovation, companies need to continuously expand their knowledge sources. As Chesbrough (2006)[23] pointed out, "the innovation process of today's business model is essentially the process of open learning, and the knowledge acquisition activities of enterprises have changed from the closed mode to the open mode.But more importantly, the enterprise also needs to absorb and integrate the external knowledge acquired, so as to create new knowledge. Absorbing and integrating knowledge is the key to business model innovation, which is an important step for enterprises to digest new knowledge. Only after the complementary knowledge is digested and absorbed, can the enterprise integrate the old and new knowledge, embed the new knowledge into the organization, integrate the new knowledge into the organizational context, construct the new model, and realize the business model innovation.Therefore, the following hypothesis is proposed in this study:

H2: knowledge transfer has a positive relationship business model innovation.

2.3. Partner heterogeneity and knowledge transfer

Partner heterogeneity is reflected in diversity[24-25]. Diversity mainly emphasizes differences in resources, capabilities, and knowledge, while diversity primarily reflects the diversity of partners. Therefore, the relationship between the company and its partners is not only a bilateral relationship, but also a network relationship. Enterprises are essentially a combination of unique resources. Different companies have different resources, so heterogeneous resources are the main means for enterprises to gain competitive advantage[26-27]. When a company lacks a certain resource, it can search through various networks and acquire external resources through transmission after locking the target. In fact, heterogeneous partners can make up for the weaknesses of the company's knowledge, so heterogeneous partners as a source of knowledge become a key factor in knowledge transfer between the two parties.

In terms of organizational heterogeneity, different types of partners constitute a large resource circle and knowledge base of an enterprise, providing greater possibilities for knowledge transfer. transfer.Woerter(2009)[28]pointed out based on the data of several industries that the richer the diversity and differences in the industry, the higher the innovation level of the industry, while the homogenized industry is often not conducive to innovation.From the perspective of enterprise cooperation circle, when all kinds of enterprises can become partners of enterprises, the initiative of innovation of all parties will be encouraged and knowledge transfer activities will happen frequently.

In terms of knowledge heterogeneity, complementary knowledge is the key factor to drive knowledge transfer. Cooperation between enterprises mainly lies in complementary advantages, following the collaborative logic of "1+1>2". The main reason why companies are willing to absorb the knowledge of integration partners is that the stock knowledge of heterogeneous partners is often the weak board in the "innovation barrel". It can be seen that as a recipient, companies are always willing to accept the heterogeneous knowledge of partners and continue to promote the development of knowledge transfer activities. Therefore, this study proposes the following assumptions:

H3a: organizational heterogeneity has a positive relationship with knowledge transfer.

H3b: knowledge heterogeneity has a positive relationship with knowledge transfer.

2.4. Mediating effect of knowledge transfer

Research on partner heterogeneity mainly focuses on the contribution of heterogeneous subjects to innovation in open innovation due to their complementary resources, capabilities and knowledge. Due to the openness of business model, heterogeneous partnership is a necessary condition for business model innovation. Partner heterogeneity has a significant impact on business model innovation, whether from the perspective of resource dependence or organizational learning. However, the knowledge owned by heterogeneous partners is usually in the static state of stock, and only when the knowledge changes from the stock state to the flow state can its complementary effect on focus enterprises be effectively exerted. Knowledge transfer is the flow process of knowledge between knowledge source and knowledge receiver, and is the key factor of knowledge from static to dynamic. Therefore, the more heterogeneous partners are, the more complementary they can be to focus enterprises, and the more they can promote the occurrence of knowledge transfer, thus promoting the innovation of business model. It can be seen that partner heterogeneity is a necessary condition for business model innovation, which determines the "wooden barrel short board" of business model innovation.Therefore, the following hypothesis is proposed in this study:

H4a: knowledge transfer plays an intermediary role between organizational heterogeneity and enterprise business model innovation.

H4b: knowledge transfer plays an intermediary role between knowledge heterogeneity and enterprise business model innovation.

In conclusion, the research and hypothesis model of this study are shown in figure 1:
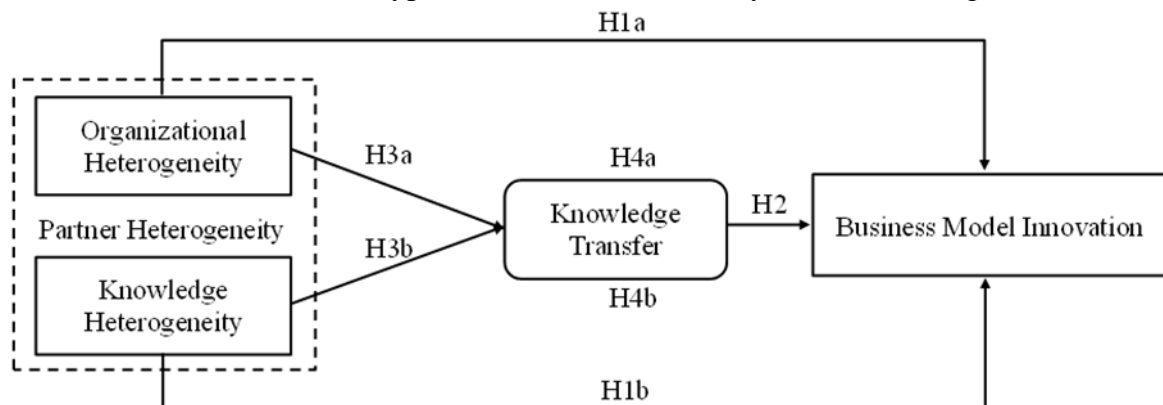

Figure 1 Theoretical model.

3. Methodology

3.1. Sample and data

The questionnaires prepared by the Institute are based on the mature scale at home and abroad, and extensively solicit opinions from experts in relevant fields, and consider feedback and suggestions from senior executives. It has a theoretical basis and considers the industrial market. In order to verify the scientificity and rationality of the questionnaire and improve the quality of the formal questionnaire, this study conducted a small sample test on the questionnaire, which laid a solid foundation for the next step of experience.

In general, the questionnaire consists of four parts: (1) the basic information of the enterprise, including the age of the enterprise and the size of the enterprise. (2) The measurement of business model innovation refers to the scale of Zott and Amit (2007)[29], and selects nine indicators to measure the variables of business model innovation. (3) The tissue heterogeneity measurement of partner heterogeneity was optimized with reference to the measurement method developed by Blau (1977)[30]. The measurement of partner heterogeneity of knowledge heterogeneity is based on the scale developed by Lee et al for measuring knowledge transfer[31], with reference to the scale compiled by Kale et al. (2000) [32]. Except for the hundred-point scale of organizational heterogeneity, all other variables use 7 points, with 1 being strongly disagree, 7 being strongly agreed, and so on.

3.2. Reliability and validity

In this study, the Cronbach coefficient alpha values are all above 0.700, so the questionnaire passes the reliability test. The KMO values of the variables exceed 0.765 and the significant probability of Bartlett ball type test were all significantly higher than that of the other variables. Bartlett's spherical Sig values less than 0.001. In addition, the cumulative variance contribution rate of each variable is more than 75%, indicating the construct and validity of scales well. This study uses the enterprise age and scale as the control variables.

4. Data analysis and results

4.1. Descriptive statistical analysis

This study conducted questionnaire survey on middle and senior managers or founders of enterprises in Sichuan and Chongqing of China. Questionnaires were distributed mainly through the following three channels: first, questionnaires were distributed to students above the middle level through the MBA and EMBA platforms of the university; Second, participate in BBS of related enterprises, and hand out questionnaires on site; Third, a certain number of questionnaires were distributed and collected through government channels.655 questionnaires were distributed through the above three channels, and a total of 443 questionnaires were recovered. After partial invalid and repeated questionnaires were eliminated, 386 valid questionnaires were obtained, with an effective recovery rate of 58.93%.Through the preliminary statistics and analysis of the questionnaire, we can know the basic information of the sample such as enterprise age, number of enterprises and sales revenue. The basic features of the sample are shown in Table 1.

Table 1 Basic characteristics of samples (N=386).

Characteristics			Number of samples	Percentage
Enterprise age		Less than 1 year	16	4.15%
		1 - 3 years	60	15.54%
		3 - 8 years	110	28.50%
		More than 8 years	200	51.81%
Enterprise scale	Enterprise employees	Less than 50 people	95	24.61%
		50 - 199 people	92	23.83%
		200 - 499 people	84	21.76%
		500 - 999 people	35	9.07%
		More than 1000 people	80	20.73%
	Sales revenue	Less than 1 million	33	8.55%
		1 - 5 million	66	17.10%
		5 - 10 million	47	12.18%
		10 - 50 million	73	18.91%
		More than 50 million	167	43.26%

4.2. Correlation analysis

In order to study the relationship between the three variables of partner heterogeneity, knowledge transfer and business model innovation, a correlation analysis was performed for each variable, and the results are shown in the Table 2. It can be seen from the data in it. Business model innovation is positively correlated with partner heterogeneity and knowledge transfer. Organizational heterogeneity in partner heterogeneity is positively correlated with knowledge heterogeneity and knowledge transfer.

Table 2 The correlation matrix between variables (N=386).

	1	2	3	4
1 Business model innovation	1			
2 Organization heterogeneity	0.117*	1		
3 Knowledge heterogeneity	0.403**	0.140**	1	
4 Knowledge transfer	0.540**	0.170**	0.600**	1
Note: N=386;*p<0.05;**p<0.01;***p<0.001				

4.3. Regression analysis

As can be seen from Model 2, in Table 3, it can be seen that the heterogeneity of the heterogeneous organization of the partner, the knowledge heterogeneity, and the regression coefficient of the business model innovation standard are 0.298 and 0.184, respectively, and are positive and positive heterogeneity. Partner heterogeneous organizations, knowledge heterogeneity and business model innovation are positively correlated, in terms of meaning, SIG < 0.001, explaining the heterogeneity of partner heterogeneous organizations, as well as knowledge heterogeneity and major business model innovations, H1a and H1b Confirmed. From Model 3, it can be found that the standard regression coefficient of knowledge transfer and business model innovation is 0.564, which further indicates that knowledge transfer is positively correlated with business model innovation, SIG < 0.001, indicating that knowledge transfer is significantly related to business model innovation, and H2 is confirmed. It can be found from the Model 4, the partners

heterogeneous organization heterogeneity and the heterogeneity of knowledge and knowledge transfer standard regression coefficient of 0414 and 0.580 respectively, and is positive, a further sign of partner heterogeneous tissue heterogeneity and the heterogeneity of knowledge and knowledge transfer are related, and in terms of significance, SIG < 0.001, explain partner heterogeneous tissue heterogeneity and the heterogeneity of knowledge was associated with a significant knowledge transfer, H3a and H3b are confirmed.

According to the mediating effect test procedure, Model 2 and Model 4 verify equation (1) and equation (2) respectively:

$$BMI = c_1 OH + c_2 KH + e_1 \qquad\qquad (1)$$
$$KT = a_1 OH + a_2 KH + e_2 \qquad\qquad (2)$$

Where BMI represents business model innovation, OH represents organizational heterogeneity, KH represents knowledge heterogeneity, and KT represents knowledge transfer. According to the next step of the program, equation (3) should be verified:

$$BMI = c'_1 OH + c'_2 KH + bKT + e_3 \qquad\qquad (3)$$

Table 3 Results from Regression analysis.

Variable	Model 1	Model 2	Model 3	Model 4	Model 5
	Business model innovation	Business model innovation	Business model innovation	Knowledge transfer	Business model innovation
Control variables					
Enterprise age	0.017	0.153	0.33	0.106	0.195
Enterprise employees	0.060	0.142	0.66	0.128	0.024
Sales revenue	0.061	0.113	0.020	0.112	0.075
Explanatory variables					
Organizational heterogeneity		0.298***		0.414***	0.134**
Knowledge heterogeneity		0.184***		0.580***	0.116***
Knowledge transfer			0.564***		0.448***
Statistic					
R^2	0.007	0.483	0.307	0.382	0.313
$\triangle R^2$	0.015	0.476	0.305	0.349	0.145
F	1.943	60.873***	43.564***	48.532 ***	30.255***
VIF	2.045	2.082	1.043	1.041	1.639

Note: N=386; *p<0.05;**p<0.01;***p<0.001

Regression analysis leads to Model 5, and you can see that b and c'_1 are 0.448 and 0.134 respectively, with significant coefficients, indicating that knowledge transfer plays a part of mediating role between organizational heterogeneity of partner heterogeneity and business model innovation. b and c'_2 were 0.484 and 0.116, respectively, and the coefficients were significant, indicating that knowledge transfer played a part of mediating role between knowledge heterogeneity

of partner heterogeneity and business model innovation. Hypothesis H4a and H4b were partially verified.

5. Conclusion

This study based on the understanding of the nature of the business model to build the "partners heterogeneity, knowledge transfer, business model innovation" of the theoretical model, from the visual angles partner heterogeneity, knowledge transfer as the middle path, business model innovation as the end-result and deeply discusses the heterogeneity, the relationship between knowledge transfer and business model innovation, and based on the assumption of sample data of 386 are verified. The following conclusions are drawn:

(1) Partner heterogeneity is good for business model innovation. Business model innovation is a typical open innovation that requires the cooperation of key enterprises and partners. Partner heterogeneity suggests that the primary basis for selecting a partner is heterogeneity. The empirical results show that partner heterogeneity has a positive impact on business model innovation, indicating that heterogeneous partners are an important factor in promoting business model innovation. Therefore, in the practice of business model innovation, enterprises should work closely with heterogeneous partners to form complementary advantages, make up for the lack of knowledge, and form innovative synergies.

(2) Knowledge transfer has a positive impact on business model innovation. This paper argues that knowledge transfer has a significant positive impact on business model innovation. In the era of knowledge economy, knowledge transfer is a key factor driving business model innovation.

(3) Knowledge transfer plays a mediating role between partner heterogeneity and business model innovation. This paper empirically finds that knowledge transfer plays an important intermediary role between partner heterogeneity and business model innovation. Only through knowledge transfer, supplemental stock knowledge can become mobile knowledge, and it can absorb and integrate complementary knowledge among key enterprises and partners, and further generate new business model structure. After knowledge transfer, enterprises and partners can form a closed loop of knowledge transfer and sharing. Enterprises absorb new knowledge, export new knowledge, and make up for each other's shortcomings. At the same time, they can create new knowledge to further promote innovation.

References

[1] Martins L, Rindova V P, Greenbaum b. e. Unlocking The Hidden Value Of Concepts: a Cognitive Approach To Business Model Innovation[J]. Strategic Entrepreneurship Journal, 2015, 9(1):99-117.

[2] Bouncken, r. b. Innovation by Operating Practices in Project Alliances -- When Size Matters[J]. British Journal of Management, 2011, 22(4), 586 -- 608

[3] Business Model Innovation and third-party Alliance on the Survival of New Firms[J]. Technovation, 2015, 35:1-11.

[4] Corsaro D, Cantu C, Tunisini a. Actors' Heterogeneity in Innovation Networks[J]. Industrial Marketing Management, 2012, 41(5):780-789.

[5] Agrawal a. k. l. University - To - Industry Knowledge Transfer: Literature Review And Unanswered Questions [J]. International Journal Of Management Reviews, 2001, 3 (4), 285-302.

[6] Fischer E, Reuber A r. Targeting Export Support to SMEs: Owners' International Experience as A Segmentation Basis[J]. Small Business Economics, 2003, 20(1):69-82.

[7] Oerlemans L A G, Knoben J, Pretorius M w. Alliances Portfolio Diversity, Radical And Incremental Innovation: The Moderating Role Of Technology Management[J]. Technovation, 2013, 33(6-7):234-246.

[8] Hemmert M, Bstieler L, Okamuro h. Bridging The Cultural Divide: Trust Formation In University - Industry Research Collaborations In The Us, Japan, And South Chesapeake [J]. Technovation, 2014, 34 (10) : 605-616.

[9] Antkrah S, al-tabbaa o. Industry Collaboration: a Systematic Review[J]. Scandinavian Journal of Management, 2015, 31(3):387-408.

[10] Granstrand o. Towards a Theory Of The technology-based Firm[J]. Research Policy, 2004, 27(5):465-489.

[11] Swaminathan V, Moorman c. Marketing Alliances, Firm Networks, and Firm Value Creation[J]. Journal of Marketing, 2009, 73(5):52-69.

[12] Spender J C, Scherer A g. The Philosophical Foundations of Knowledge Management: Editors' Introduction[J]. Organization The Critical Journal of Organization Theory & Society, 2007, 14(1):5-28.

[13] Barney J, Wright M, Ketchen D j. The resource-based view of The firm: Ten years after 1991[J]. Journal of Management, 2001, 27(6):625-641.

[14] Rodan told S, Galunic c. wining Network Structure: How Knowledge Heterogeneity Influences Managerial Performance And Innovativeness [J]. Strategic Management Journal, 2004, 25 (6) : 541-562.

[15] Osterwalder, a., Pigneur, Y., Tucci, C.L. Clarifying The Business Models: Origins, Present, And Future Of The Concept [J]. Journal Of Communications Of The Association for Information Systems, 16, 2005:1-25

[16] Mina, a., Bascavusoglu-Moreau, e., Hughes, a. Open Service Innovation And The Firm's Search For External Knowledge[J]. Research Policy, 2004, 43(5):853 -- 866

[17] Chang, j. The Effects Of buyer-supplier's Collaboration Onknowledge And Product Innovation[J]. Industrial MarketingManagement, 2017, 65, 129 -- 143.

[18] Gilbert M, Godrey-Hayes M. Understanding the process of knowledge transfer to achieve successful technological innovation[J]. Technovation, 1996, 16(6):301-312.

[19] Hendriks, p. Why Share Knowledge? The Influence Of Ict On The Motivation For Knowledge Sharing[J]. Knowledge Process Management,1999,6(2),91-100

[20] Ravasi D, Turati c. Exploring Entrepreneurial Learning: a Comparative Study Of Technology Development Projects[J]. Journal Of Business Venturing, 2005, 20(1):137-164.

[21] Teece D j. Business Models, Business Strategy and Innovation[J]. Long Range Planning, 2010, 43(2):172-194.

[22] Zhao J, Wang M, Zhu L et al. Corporate Social Capital And Business Model Innovation:The Mediating Role Of Organizational Learning[J]. Frontiers Of Business Research in China, 2014,

8(4):500-528.

[23] Chesbrough, h., Vanhaverbeke, w., West, j. Open Innovation:Researching A New Paradigm.New York: Oxford University Press, 2006

[24] Beckman C M, Haunschild P r. Network Learning: The Effects Of Heterogeneity Of Partners' Experience On Corporate Acquisitions[J]. Administrative Science Quarterly, 2002, 47(1):92-124.

[25] Phelps, c. c. a Longitudinal Study Of The Influence Of Alliance Network Structure And Composition On Firm Exploratory innovation[J]. Academy Of Management Journal, 2010, 53(4),890 -- 913.

[26] Wernerfelt, b. The resource-based View Of The Firm [J]. Strategic Management Journal, 1984, 12(5):171-180.

[27] Barney, j. Firm Resources and Sustained Competitive Advantage [J]. Journal of Management, 1991 (17) : 99-120.

[28] Woerter, m. Industry Diversity And Its Impact On The Innovation Performance Of Firms: An Empirical Analysis Based On Panel Data[J]. Journal Evolutionary Economics, 2009, 19:675-700.

[29] Zott C, Amit r. Business Model Design And The Performance Of Entrepreneurial Firms [J]. Organizationscience, 2007, 18(2):181-199.

[30] Blau p. Inequality And Heterogeneity: a Primitive Theory Of Social Structure[J]. New York: Free Press, 1977.

[31] Lee S, Park G, Yoon B, et al. Open Innovation In Smes -- An Intermediated Network Model[J]. Research Policy, 2010, 39(2):290-300.

[32] Kale P, Singh H, Perlmutter h. Learning And Protection Of Proprietary Assets In Strategic Alliances: Building Relational Capital[J]. Strategic Management Journal, 2000, 21(3):217-237.