Knowledge Network Evolution of Smokers, Adaptive Behaviors and Enhancement of Knowledge Capability

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Objectives: With the evolution of knowledge networks of smokers, we analyzed how adaptive behaviors affect the enhancement of the knowledge capability of their organization. Methods: Through the empirical analysis of 228 questionnaire data from smoker-dense zone, this paper conducts a regression analysis between the implementation of different behaviors and the capability improvement, in the context of knowledge flow evolution. Results: Conclusions show that different behavioral decisions of knowledge subjects have different influences on their knowledge capability, and the routine behaviors have a significant negative impact on their knowledge capability, while the imitative behavior and innovative behavior have a significant positive impact on the improvement of knowledge capability. These effects are also affected by the regulatory effects of the three stages of knowledge flow. Conclusion: In different stages of the functional evolution of the knowledge network of smokers, different behavioral decisions of knowledge subjects will promote or restrict their own knowledge capabilities. Based on the knowledge growth expectation, knowledge subjects can adopt different behavior strategies to achieve dynamic environment adaptation and gain competitive advantage.

Keywords: knowledge network; smokers;behaviors; knowledge capability

Tob Regul Sci.™ 2021;7(6): 5656-5681
DOI: doi.org/10.18001/TRS.7.6.52

INTRODUCTION

Innovation is achieved in a complex network of many factors that constantly interact,[1,2]and the same is true in the network of smokers. The form of networking-cooperation represents a special coordination rule,which not only enhances the capability to form the organization itself, but the rules themselves also represent an capability, both of which are jointly owned by the organizations in the network. The smokers' network is constantly evolving,with the evolution of the content and form of the topological structure and network function of the knowledge network, the basic environment for

the survival and growth of the knowledge subject, be it an enterprise, an organization, or an individual, is constantly changing,[3]also resulting in the changing of a series of related attributes of the knowledge subject, such as the network location, disposable resources, and the power relationship.In order to cope with new changes and new situations, from a rational perspective, knowledge subjects can adapt to the evolutionary needs of knowledge networks of smokers by implementing adaptive behaviors to achieve better development. To obtain and maintain competitive advantages, a subject such as an organization should foster capability and highlight the comprehensiveapplication of various abilities. Therefore, the main innovation problem to be solved for the organizations is to foster knowledge capability,[4] so as to adapt to the dynamic and complicated environmental change of the knowledge network, to continuously absorb knowledge from the outside of an organization, and totimely coordinate, update, and reconstruct knowledge, resources and abilities inside and outside the organization, thereby achievingsustainable development.

Smoking often promotes the formation of social networks among smokers and further strengthens the possibility of innovative cooperation among smokers' dense organizations. According to the related studies regarding the capabilities of the existing networksubjects in the field of management, scholars have different definitions of network"capability" and investigate this issue from various perspectives. For example, many researchers explore organizational capability,[5] local capability,[6] network capability,[7] knowledge capabilities,[4,8] knowledge creation capabilities,[9] knowledge power,[10] and technological capability.[11]Although describing in different ways, the studies mentioned above basically examine the power and ability of the subjects in the network to control the innovation resources such as knowledge. In general, the greater the power (or the stronger the ability), the stronger the subjects' innovation capability, and the higher the expected innovation performance level and the interest ratio. Given the operational characteristics of the organizational model of the knowledge network of smokers, this paper defines this innovation capability as knowledge ability based on the conceptsfrom relevant scholars; it then explores the relationship between the knowledge subjects' behavior and the enhancement of knowledge capability in the functional evolution of the knowledge network of smokers, to clarify the relationship between the adaptive behaviors and knowledge capability of knowledge subjects, and also to explore the moderating role of functional evolution, namely, environmental factors, in this main effect. Our studyis expected to help core technological innovation entities like enterprises optimize their operational decisions.

LITERATURE REVIEW

The Concept andExtension of Knowledge Capability

Capability refers to the way enterprises achieve organizational goals and create value by optimizing the allocation of resources.[12]According to evolutionary economics,[13] firms have incomplete knowledge under uncertain conditions but have certain knowledgeand capacity for production planning and decision making at a given time.Under the environment selection mechanism, theexisting management or knowledge of an enterprise determines the result of competitionbetween business organizations.According to the knowledge theory, knowledge capability refersto a possibility that an organization makes full use of knowledge, such asgeneration, acquisition, sharing,and application of knowledge, to achieve success.[14] In resource-based view, knowledge capacity is the sum of knowledge assets that determine the ability of firms to absorb and generate new knowledge.[15]This concept is basically in line with the concept of knowledge management capability, which is embodied in a series of knowledge management activities an enterprise conducts to achieve organizational performance and competitive advantage by organizing, mobilizing, and rationally allocating knowledge resources.[4]

Whether knowledge capabilityis effectively developed is the premise of efficientknowledge flow between the subjects, determining the relative advantage of knowledge sharing efficiency,

knowledge creation level,as well as knowledge stock and flow. The subjects develop theirknowledge from four aspects, namely individual technology, organizational technology, personal skills and behavior,as well as organizational skills and behavior.Wei et alhold that interactive learning is the main approach to building knowledge capacity;therefore, to enhance knowledge ability,the subjects should start with optimizing interactive learning.[16]

The level of knowledge ability is relative rather than absolute; with the passage of time, the performance value created out of the subjects'original knowledge capability shows a decreasingcharacteristic. This is closely related to the life cycle of knowledge.Birkinshaw and Sheehanclaim that knowledge innovation has a life cycle of "creation, mobilisation, diffusion, and commodification";[17]it directly affects the subjects' capacities, determining the dynamic characteristics of theirknowledge capability.Similar to the role of core competitiveness, knowledge capacityenables the subjects to create more value which is harder for theiropponents to compete with. Nevertheless, such value has certain rigidity after it is formed.[18]Given the interaction between the subjects' knowledge capability and the network environment, the formation of such knowledge capabilitydoes not happen once and for all. Rather, knowledge capability will be lost if the subjects do not use it, and the value of knowledge capability shows a diminishing trend.

The Composition of Knowledge Capability

Knowledge capability can be grouped into two categories: static and dynamic.[14] Static knowledge capability refers to the existing knowledge resources the subjects own, such as holding a number of underutilized technology patents and intellectual property rights. The subjects may obtain benefits through direct production or patent licensing. It also refers to the construction ofthe knowledge system among the subjects so as to effectively accumulate staff experience and expertise or to capture knowledge spillover. The reason why such knowledge capability is relatively static is because it is characterized by stability and such capability may be fully developed regardless of time limits. Dynamic capability has strict time constraints, since survival in a dynamic environment means "eitherprogressing or regressing". The knowledge subjects should always adjust behavior to adapt to the new network environment. In practice, especially for the development of new technology and product marketing, the subjects' dynamic knowledge capability enables them to develop a sustainable competitive advantagein a complex environment.[19]Gold and Arvind argue that the infrastructure and the process of knowledge activities jointly determine the organizational effectiveness.[4] Hence, theydivide knowledge capability into two aspects: knowledge infrastructure capability and knowledge process capability. Based on the above research, Yang and Chen point out that the subjects' knowledge capability has a positive relationship with their knowledge sharing behavior.[20]In addition, they also argue that knowledge activities with a feature of learning embeddedness facilitate the subjects'creativity and that organizational knowledge capability is determined by their learning ability.[21] Further, they group knowledge capability into two categories. Obviously, resources such as knowledge and technology, organizational structure, and social capital are the preconditions for the construction and maintenance of the subjects' knowledge capability, directly impacting the core competence of an organization. Given spillovers of cooperation among the subjects in the knowledge network of smokers, it is vital to foster the dynamic knowledge capabilities, for instance, the absorptive capacity, the reconstruction capability, and the protective capability.[22] This is largely attributed to the fact that only by maintaining dynamic learning can the subjects adapt to environmental changes and knowledge flow processes, so that they may enhance theirability of resource allocation and effectiveness of knowledge use, achieving sustainable competitiveness. Based on the above discourse, this paper asserts thelevel of knowledge capability depends on two aspects: static resources and dynamic capability. Static resources consist of knowledge resource, structural capital, and organizational culture, while dynamic capability

comprises knowledge absorptive capacity,knowledge reconstruction capability, and knowledge protection capability.The following research hypotheses are postulated on the assertion.

RESEARCH HYPOTHESES

Given the complex and dynamic collaborative environment consisting of the knowledge networks of smokers, the optimal goal, and the scarcity of knowledge, the knowledge subjects have three behavior strategies: *routine behavior, imitative behavior,*and *innovative behavior*.[13]The subjects expect to achieve "at least the same good results as now" when adopting the routine strategy; "better results than now or at least the same good results as others" when selecting the imitative behavior; "better results than now or others" when using the innovation strategy.

Routine behavior is considered to be anorganizational behavior with repetition or few changes in the subjects'operating rules and habits. It is embedded with various elements, including the organizational structure, culture, strategy formulation, and implementation processes, and it may be gradually strengthened.[23] In a dynamic environment, relatively reasonablebehaviorrules that are beneficial to reducingthe operating costs and to enhancing managerial effectiveness are developed via organizational routines.[24] The routines, however,are merely "behavioral compromises" reducing uncertainty and conflicts among organization; hence, the subjects' knowledge infrastructure and activities are not improved. With the passage of time, routine behavior will result in a negative cumulative effect or a negative feedback effect. Considering the diminishing returns caused by other knowledge subjects' continuous development, the subjects' capabilitieswill not be improved and theircompetitive advantages will be weakened in the long run if such "negative" routine behavior persists. It is called a "progressing or regressing"phenomenon.

Imitative behavior is a "variation of the routines".[13] Due to the lack of innovative motivation and ability, the subjectsadopt this strategy; they select appropriatetargets to study, investigate, and examine, thereby understanding the secret to their opponents' success. Then, they develop and implement the imitative schemes within an organization. Imitative behaviorenablesthe subjects to catch up with other competitors in a relatively short period of time, savingtime and cost and improving the organizational effectiveness. Nevertheless, due to the imperfect imitability of tacit knowledge and the protection measures of imitated targets, the effectiveness of the imitation strategy is greatly reduced. Imitative behaviorleads to equalization of profits (interests) in the long run, reducing the competitive advantage of the knowledge network of smokers.

In a competitive environment, innovation is the key to improving knowledge and achieving sustainable development.[25]*Innovative behavior* requires a large amount of knowledge, resources, capabilities, and inter-organizational cooperation in the network. The knowledge subjects build and enhance their dynamic capability through obtaining, transmitting, sharing, integrating, and comprehensively utilizing the internal and external knowledge of an organization. Meanwhile, the subjects effectively and optimally allocate and updateall kinds of resources, thereby better adapting to the uncertain and dynamic changes of the network environment.[26]Maes and Selsclaim that the subjects' knowledge sharing behavior is closely related to the enhancement ofknowledge capability.[27] Hence, under the complex and uncertain environment, the knowledge subjects will select innovation to improve their capability, since they may obtain more than average returns via this strategy.

From the perspective of innovation, the assumption of bounded rationality should be extended to knowledge rationality. Routine behavior enables the knowledge subjects to maintainexisting knowledge, whilethe imitative and innovative strategies assist them to createnew knowledge. The choice of different behavioral strategies has different impacts on the subjects' knowledge capabilities. Based on the above analysis, the following assumptions are obtained.

H1a: The knowledge subjects' routine behavior has a significantly negative impact on their knowledge capability.

H1b: The knowledge subjects' imitative behaviorhas a significantly positive impact on their knowledge capability.

H1c: The knowledge subjects' innovative behavior has a significantly positive impact on their knowledge capability.

The knowledge subjects interact in a network.Knowledge sharing among organizations is facilitated, and the efficiency of knowledge creation is optimized when each subject enhances their capability. Then, the network obtains relative advantagesin terms of knowledge stock and flow. Meanwhile, the gradual evolution and efficiency change of knowledge flow have an impact on the interaction between the subjects and on their capabilities as well; that is, knowledge flow has exogenous influence on the interaction between and capabilities of the knowledge subjects. Overall, knowledge flowfacilitates efficient integration of knowledge resources among the network subjects. Since interdependency between the subjects provides a basis forknowledgeflow,[28]the interaction between the subjects is at a low level when knowledgeflows slowly. Given the relational embeddedness of knowledge flow,[29] a low level of knowledge flow hinders the formation of the knowledge subjects' social capital. Moreover, it reduces communication and interaction between thesubjects. The low efficiency of knowledge flow is not conducive tothe increase in thesubjects' knowledge stock.

In the context of smokers' social networks,[32]Knowledge flow reduces the diversity of knowledge between the network subjects, resulting in knowledge assimilation. Knowledge assimilation belongs to the entropy increase of a system.If neithernew knowledge is createdwithin thenetwork, norexternal knowledge is introduced, with the inter-organizational flow of knowledge, the diversityof the knowledge subjects will gradually decrease until it is completely assimilated.Then, the negative entropy flow may be generated and the evolutionary direction may be reversed only through innovation or the introducti on of external knowledge. In terms of the structural embeddedness of knowledge flow, the change of knowledge flow is closely related to the strong and weak connection between the subjects and to the "structural hole" of the network.[30]The subjects' innovative behavior is influenced by other subjects as well as the social and cultural factors.[31] It is characterized by a positive feedbackformed in the long-term interactive cooperation process. That is, the subjects' behaviorembedded in the overall social and economic relations is influenced bythe entire network structure and the interaction between the subjects. This interactive relationship facilitates the sharing of all kinds of resources such as knowledge, technology, and information, and promotes the diffusion of innovation.

In this context, the knowledge subjects' routine behavior widens the gap of knowledge stock between them and other network members, resulting in the phenomenon of "either progressing or regressing". Nonetheless, as for imitative behavior, knowledge generated by the knowledge creation activities provides more imitative opportunities and knowledge increments, by which the subjects may achieve their objectives. For the knowledge subjects implementing innovative behavior, it is not beneficial. This can be largely attributed to the fact that over-emphasis on differentiation and dynamics, ignoring the absorption of the existing achievements and the "digestion"of innovative knowledge leads to a waste of resources, resulting in the diseconomies of scope. However, after the overall knowledge advantage of the network is formed,[33]given the economic effect of knowledge spillover caused by knowledge diffusion,[34]the knowledge subjects will maintain a relatively competitive advantage over a period of time. The effect of the subjects' behavior on theircapability will be gradually increased due tothe leverage role; hence, similar to the transition of the energy level, there will be an increase in theirknowledge capability.

Accordingly, in the functional evolution of the knowledge network of smokers,the efficiency and function change of knowledge flow at different stages have a "leveraging" or "restraining" effect on the interaction between knowledge subjects and on the changes in their knowledge

capabilities,thereby enhancing or weakening their capacities. Based on the above analysis, the impacts of the subjects' behavior on their knowledge capability aremediatedby various stages of knowledge flow. Hence, the following hypotheses are obtained:

H2a: The impacts of the subjects'routine behavior on their knowledge capabilityareadjusted by knowledge sharing. The higher the level of knowledge sharing, the weaker the impacts of the subjects' behavior on their knowledge capability.

H2b: The impacts of the subjects' imitative behavior on their knowledge capabilityare mediated by knowledge sharing. The higher the level of knowledge sharing, the weaker the impacts of the subjects' behavior on their knowledge capability.

H2c: The impacts of the subjects' innovative behavior on their knowledge capabilityareadjusted by knowledge sharing. The higher the level of knowledge sharing, the stronger the impacts of the subjects' behavior on their knowledge capability.

H3a: The impacts of the subjects' routine behavior on their knowledge capabilityareadjusted by knowledge creation.The higher the level of knowledge creation, the strongerthe impacts of the subjects' behavior on their knowledge capability.

H3b:The impacts of the subjects' imitative behavior on their knowledge capabilityaremediated by knowledge creation. The higher the level of knowledge creation, the stronger the impacts of the subjects' behavior on their knowledge capability.

H3c: The impacts of the subjects' innovative behavior on their knowledge capabilityareadjusted by knowledge creation. The higher the level of knowledge creation, the weaker the impacts of the subjects' behavior on their knowledge capability.

H4a: The impacts of the subjects' routine behavior on their knowledge capabilityareadjusted by the formation of knowledge advantage.The higher the efficiency of such development, the strongerthe impacts of the subjects' behavior on their knowledge capability.

H4b: The impacts of the subjects' imitative behavior on their knowledge capabilityare mediated by the formation of knowledge advantage. The higher the efficiency of such development, the stronger the impacts of the subjects' behavior on their knowledge capability.

H4c: The impacts of the subjects' innovative behavior on their knowledge capabilityareadjusted by the formation of knowledge advantage. The higher the efficiency of such development, the stronger the impacts of the subjects' behavior on their knowledge capability.

Based on the above analysis, the research framework is proposedin Figure 1.

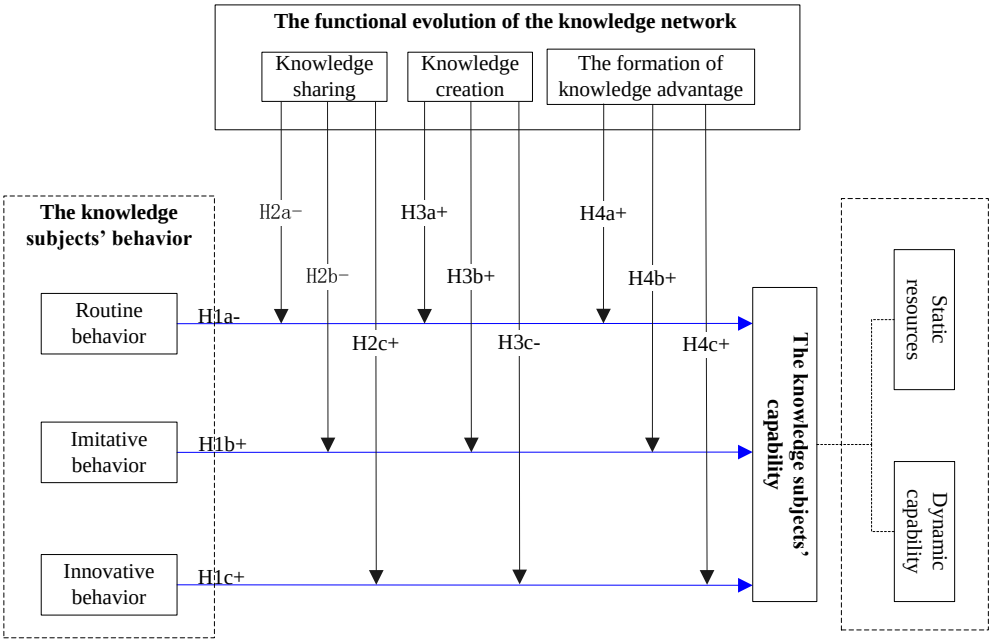

Figure 1 Relationships between the subjects' behavior and their capability in the functional evolution of the knowledge network

METHODS

Regression Model

This paper studies the influence of the subjects' behavior on the enhancement of knowledge capability from the perspective of the evolution of a knowledge network of smokers. It then furtherinvestigates how knowledgeflow-a moderating variable mediates such influence. The possible existence of various behaviors ofthe knowledge subjectsin the process of knowledge network evolution complicates the mediating effects; therefore, this paper adopts the standard multiple linear regression to examine the moderating effect. According to the hypotheses of this paper, the knowledge subjects' behavior has significant impacts on knowledge capability, while knowledge flow of the network mediates suchimpacts. The evaluation model of the moderating effect is as follows:

$$\begin{aligned} CAP = {} & \alpha + \beta_1 RUB + \beta_2 IMB + \beta_3 INB + \beta_4 KS + \beta_5 KC + \beta_6 KA + \beta_7 KS \times RUB + \beta_8 KS \times IMB \\ & + \beta_9 KS \times INB + \beta_{10} KC \times RUB + \beta_{11} KC \times IMB + \beta_{12} KC \times INB + \beta_{13} KA \times RUB \\ & + \beta_{14} KA \times IMB + \beta_{15} KS \times INB + \varepsilon \end{aligned} \quad (1)$$

In equation 1, the sum item with the×sign is the interactive term of all the adjustment effects, andβ is the coefficient, the value of which indicates the magnitude of the adjustment effect.

Questionnaire Design and Research Variables

In this paper, a questionnaire is designed to verify the proposed hypotheses. Apart from listing the basic information of the participants, a five-level scale is usedfor measuring indexes related to the research topic. The evaluation scales 1 to 5 respectively represent the degree of recognition of the facts, comprising "completely incompatible", "relatively incompatible","a little compatible","relatively compatible", and "fully compatible". To obtain a high degree of reliability and more true data, the following optimization measures are taken in designing the questionnaire so as to avoid the problemsraised by Freeman.[35]

(1) Given that some questions are difficultto answer, the authorchose administrators andresearchers with more than one year working experiences as the research objects.

(2) Given the incomplete test results caused by the hidden information of the subjects, the author detailed the purpose and significance of this research on the first page of the questionnaire and solemnly promised that the research results areonly used for academic studies rather than any other commercial activities.The author reiterated it when giving out the questionnaires.

(3) Given the mistakes caused by wrong semantic understanding, in the process of questionnaire design, the author first invited some scholars in the research team to discuss the variable setting and measurement items. Then, they modified and adjustedsome of the itemsto ensure that the measurement itemsunder the latent variableset are reasonable and representative. In addition, according to the feedback from the small-scale pre-test, the questionnaire was supplemented and corrected, and the items that were ambiguous or difficult to answer were deleted. Hence, the wording of each item was appropriate.

(4) Given the short memory of some of the participants, the author selectedquestions related to the currentoperatingstatus of the enterprises within the recent two years whendesigning the items.

The measurement of the static resources in this paper is based on the relevant studies conducted by Gold and Arvindand Martinez et al.[4,8]Three measurement indexes, namely knowledge resources, structural capital, and organizational culture and 10 research questions are designed. As for the measurement of dynamic capability, it is mainly based on relevant research and evaluation indexes by Prietoand Martinez et al.[8,36] Given the characteristics of the knowledge network of smokers,the paperdesigns 17 research questions and three secondary indicators which are knowledgeabsorptive capacity(namely, knowledge acquisition, knowledge digestion, and knowledge application), knowledge reconstruction capability, and knowledge protection capability.In terms of the subjects' behavior, due to the complexity of behavior, it is impossible to conduct a complete investigation. This article creates three indicators (namely routine behavior, imitative behavior, and innovative behavior)and nineresearch questions based on Nelson and Winter'sdescription onthe subjects' behavior in the knowledge evolution theory. As for the measurement of knowledge flow, this paper designs three measurement indexes (namely knowledge sharing, knowledge creation, and the formation of knowledge advantage) and nine research questions. The specific variables and related explanations are shown in Table 1.

Table 1
A Description of Variables and Indicators

Variables	Indicators	Description	Source
The subjects'behavior (BHV)	Routinebehavior (RUB)	Forming a set of fixed decision rules and standardized operating procedures which are difficult to change (RUB1)	Nelson and Winter[13]; Xu[25]; Maes and Sels[27]
		Preferring stable development and always maintaining the status quo (RUB2)	
		Often acting in accordance with "customs" and "experiences" to adapt to the environmental changes (RUB3)	
	Imitative behavior (IMB)	Adapting to environmental changes by imitating the excellent technology of similar enterprises(IMB1)	
		Adapting to environmental changes by imitating the excellent management practices of similar enterprises (IMB2)	
		Achieving development by imitation is the secret to success, (IMB3)	
	Innovative Behavior (INB)	Implementing transformational management (INB1)	
		Occupying the market by developingnew technologies and introducing new products (INB2)	
		Adapting to environmental changes by adopting new organizational forms (INB3)	
Knowledge flow (FLO)	Knowledge sharing (KS)	A better knowledge sharing environment is provided in the knowledge network (KS1)	Adams and Lamont[33]; Sorenson et al[28]; Andersson et al[29]
		Eachenterprise in the knowledge network is willing to share excellent knowledge, skills, and experiences with other organizations (KS2)	
		Each enterprise in the knowledge network shares in-depth knowledge and experiencesrelated to its own advantages (KS3)	
	Knowledge creation (KC)	A high success rate of the cooperative R&D projects conducted by all the enterprises in the knowledge network (KC1)	
		The variousenterprises in the knowledge network cooperate fully, greatly improving the production process or technology (KC2)	
		All enterprises reduce the production cost and improve the performance level through cooperationin the network (KC3)	
	Knowledge advantage formation (KA)	Compared to the competitors, the knowledge network maintains a leading position in technology (KA1)	
		Compared to the competitors, the knowledge network maintains a leading position in the R&D efficiency of novel technologies and products (KA2)	
		The knowledge network has a good reputation and is a model of cooperation in its own field (KA3)	
Knowledge capability (CAP)	Knowledge resources (KR)	Excellent managers and technicians (KR1)	Gold and Arvind[4]; Martinez et al[8]
		Excellent production technology and equipment (KR2)	
		Excellent sources of knowledge and technology (KR3)	
		a number of patented technologies with independent intellectual property rights (KR4)	
	Structural capital (SC)	The organizational structure facilitates the discovery and creation ofnew knowledge (SC1)	
		Contacting with numerous enterprisesregarding knowledge and technology (SC2)	
		Effective communication with other institutions or organizations (SC3)	
	Organizational culture (OC)	Employees understand that knowledge is the key to success (OC1)	
		Employees are encouraged to actively cooperate with others,(OC2)	
		A clear expression of visions and organizational goals (OC3)	
	Knowledge absorptive capacity (KAC)	Quickly identifying the usefulness of knowledge (KAC1)	Baskerville and Dulipovici[37]; Prieto and Revilla[36]; Yang and Chen[21]; Martinez et al[8]
		A fast speed of introducing external knowledge (KAC2)	
		A stronger ability to acquire external knowledge (KAC3)	
		A good analysis and understanding of the external knowledge, (KAC4)	
		Successful integration of old and novel knowledge (KAC5)	
		Quickly and effectivelyapplying new knowledge to important work (KAC6)	
		Quickly providing new knowledge to the staff (KAC7)	
		Quickly and effectivelyapplying new knowledge to related products or services (KAC8)	
	Knowledge	Introducing significantlyimproved knowledge and technology related to the	

	reconstruction capability (KRC)	existing products and services (KRC1)	
		Timely replenishing the required knowledge, technology, and talent (KRC2)	
		Spreadingknowledge to the entire organization (KRC3)	
		Timely replacing old and obsolete knowledge with novel knowledge (KRC4)	
	Knowledge protection capability (KPC)	All employees well understand the critical knowledge of their enterprise (KPC1)	
		All employees reach a consensus on protecting the critical knowledge of their enterprise (KPC2)	
		Establishing a relatively complete system of knowledge protection (KPC3)	
		Adopting various forms of knowledge protection when collaborating with strategic partners (KPC4)	
		Reacting timely when infringed (KPC5)	

Sample Selection and Data Sources

Through this survey, this paper seeks to study what role the knowledge subjects' behavior plays in enhancing their capabilityin the functional evolution of the knowledge network, thereby examining the subjects'adaptive behavior rulein this process.According to the basic definition of the knowledge network, the research object refers to the innovative enterprises, universities, research institutes, financial institutions, consulting agencies, and government agenciesparticipating in or cooperating with the knowledge-intensive industrial clusters as well as the industry-university-research-basedinnovationleagues related to smokers. The research objects of this paper are all kinds of R&D personnel and management personnel of the knowledge-intensive institutions atthe Chengdu Hi-tech Zone with dense smokers. On the basis of pre-testing, a total of 600 questionnaires were issued.In order to avoid the homogeneity of the responses, we collect only one questionnaire from each respondent.After removing the invalid questionnaires (For instance, a large number of questions were not completed or the respondentsprovided only one answer to all the questions), a total of 228 copieswere obtained; the effective recovery rate was 38%. According to the data of the returned questionnaires, the respondents profile is listed in Table 2 and Table 3.

Table 2
The Respondents Profile

Organization type	**Enterprise**	**University**	**Financial institution**	**Research institution**	**Government agency**	**Consulting institution**	**Others**
	44.07%	33.90%	7.63%	4.24%	2.54%	1.69%	5.93%
Industry type (enterprise)	Computers and software	Electronics and communications	Manufacturing	New materials and new energy	Bio-pharmaceuticals	Chemical and textile	Others
	20.34%	13.56%	10.17%	8.47%	5.08%	1.69%	40.68%
Scale of the organization (people)	⩽300	301~500	501~1000	⩾1000	/	/	/
	25.42%	7.63%	11.86%	55.08%	/	/	/
Scale of the R&D staff (people)	⩽10	11~50	51~100	⩾100	/	/	/
	20.19%	21.15%	14.42%	44.23%	/	/	/
Age of the organization	⩽3 Years	4~5 Years	6~10 Years	⩾10 Years	/	/	/
	16.10%	8.47%	6.78%	68.64%	/	/	/

Table 3
Proportion of Organizations Engaged in Knowledge Cooperation in the Past Two Years

Quantity Organization type	Almost None	1~3	4~7	8~10	11~15	16~30	＞30
Supplier	24.58%	15.25%	6.78%	12.71%	5.93%	11.02%	23.73%
Client	18.64%	8.47%	10.17%	10.17%	10.17%	6.78%	35.59%
Business peers	14.41%	21.19%	11.02%	13.56%	11.02%	11.02%	17.80%
Research institutes	16.95%	23.73%	11.86%	10.17%	5.93%	7.63%	23.73%
University	20.34%	22.03%	13.56%	6.78%	5.08%	6.78%	25.42%
Financial institution	26.27%	22.03%	17.80%	14.41%	5.93%	4.24%	9.32%
Government agency	13.56%	19.49%	20.34%	13.56%	5.93%	7.63%	19.49%
Intermediary service agency	24.58%	22.03%	16.10%	15.25%	6.78%	6.78%	8.47%

EMPIRICAL ANALYSIS

Reliability Analysis

In this paper, the reliability and validity of the collected data are analyzed via SPSS. The reliability results reflect the consistency, stability, and reliability of the collected data. Because the attitude-oriented questionnaire (Likert Scale 5) is adopted in this paper, it is more suitable to use theCronbach'salphareliability coefficientas an indicator testingthe reliability of the data.Generally, the value of Cronbach'salpha is between 0 and 1;the larger the value, the higher the credibility of data. A new questionnaire needs to be created if the value is below 0.6. The value 0.6-0.7 indicates that the questionnaire is acceptable, whereas 0.7-0.8 suggests a high reliability of the questionnaire. By above 0.8 is meant a really high reliability.It can be seen from Table 4 that the Cronbach'salpha of the 45 variables in this study is 0.953, which indicates that the reliability of the sample is very high. That is, the sample data has a very high internal consistency, and the measurement results are more reliable.

Table 4
Overall Reliability of the Test Results

Cronbach'sα	Cronbach's αbased on standardized terms	Item
0.953	0.950	45

According to the test results of the reliability of the secondary latent variables (Table 5), the Cronbach' s alpha coefficients of imitative behavior range between 0.5-0.7, meaning that they are acceptable. Apart from this, the Cronbach's alpha coefficients of all the secondary latent variables are greater than 0.7. Some coefficients ofthe secondary latent variables such as the formation of knowledge advantage and knowledge absorptive capacity are above 0.9, indicating a high internal consistency.

Table 5

Reliability Test Results of the Secondary Latent Variables

Secondary latent variables	Cronbach's α	Cronbach's αbased on standardized terms	Item
Knowledge sharing	0.709	0.713	3
Knowledge creation	0.886	0.886	3
Knowledge advantage formation	0.907	0.908	3
Routine behavior	0.773	0.776	3
Imitative behavior	0.616	0.616	3
Innovative behavior	0.839	0.842	3
Knowledge resources	0.816	0.821	4
Structural capital	0.823	0.829	3
Organizational culture	0.857	0.861	3
Knowledge absorptive capacity	0.951	0.951	8
Knowledge reconstruction capability	0.876	0.876	4
Knowledge protection capacity	0.870	0.871	5

Validity Analysis

In this paper, factor analysis is mainly used to test the validity of the sample data;KMO test and Bartlett sphericity test are used to determine whether factor analysis is suitable or not.An exploratory factor analysis of the latent variables is first conducted via SPSS21.0; then, AMOS17.0 is used to test the validity of the sample data.

(1) TheValidity Test of Knowledge Capability

1)ConductValidity

Knowledge capability consists of six secondary latent variables, namely knowledge resources, structural capital, organizational culture, knowledge absorptivecapacity, knowledge reconstruction capability, and knowledge protection capability. The analysis of the latent variable of knowledge capability is based on the data analysis of the secondary latent variables. As can be seen from Table 6, the KMO value is 0.948, and Bartlett's sphericity test value is 2654.760.Moreover, the degree of freedom is 351, and the test significance level (Sig.)is 0.000, indicating that this set of data is suitable for exploratory factor analysis.Then,the results (See Table 7 and Table 8) are obtained via the principal component analysis and the maximum variance orthogonal rotation method. As shown in Table 7 and Table 8, three principal components are extracted from the six secondary latent variables of knowledge capability, explaining67.801% of the total variance. After usingthe maximum orthogonal rotation of variance, the paper finds that the load coefficients of some items are less than 0.6; hence, these items need to be further adjusted.

Table 6

KMO and Bartlett's Test of Structural Factors of Knowledge Capability

Kaiser-Meyer-Olkin Measure of Sampling Adequacy		**0.948**
Bartlett's Test of Sphericity	Approx. Chi-Square	2654.760
	Df	351
	Sig.	.000

Table 7

Total Variation of the Structural Factor of Knowledge Capability (1)

Component	Initial eigenvalue			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	Variance %	Cumulative %	Total	Variance %	Cumulative %	Total	Variance %	Cumulative %
1	16.021	59.336	59.336	16.021	59.336	59.336	8.944	33.127	33.127
2	1.242	4.602	63.937	1.242	4.602	63.937	4.967	18.395	51.523
3	1.043	3.864	67.801	1.043	3.864	67.801	4.395	16.278	67.801
4	.853	3.159	70.960						
5	.720	2.665	73.625						
6	.681	2.521	76.146						
7	.662	2.452	78.598						
8	.560	2.076	80.673						
9	.529	1.960	82.633						
10	.508	1.882	84.515						
11	.422	1.561	86.076						
12	.419	1.553	87.628						
13	.364	1.350	88.978						
14	.335	1.240	90.218						
15	.330	1.223	91.441						
16	.303	1.122	92.563						
17	.280	1.037	93.600						
18	.261	.965	94.565						
19	.236	.875	95.440						
20	.231	.854	96.294						
21	.211	.783	97.077						
22	.172	.637	97.715						
23	.161	.595	98.310						
24	.148	.549	98.859						
25	.127	.470	99.329						
26	.095	.354	99.682						
27	.086	.318	100.000						

Note.
Extraction method: principal component analysis

Table 8

The Rotational Component Matrix of the Structure of Knowledge Capability (1)

Secondary latent variable	operating variable	components		
		1	2	3
Knowledge resources	KR1	.364	.502	.433
	KR2	.125	.691	.376
	KR3	.520	.600	.146
	KR4	.322	.530	.449
Structural capital	SC1	.407	.659	.324
	SC2	.261	.791	.081
	SC3	.495	.623	.127
Organizational culture	OC1	.575	.479	.268
	OC2	.704	.347	.267
	OC3	.553	.451	.336
Knowledge absorptive capacity	KAC1	.679	.393	.272
	KAC2	.701	.293	.239
	KAC3	.720	.343	.265
	KAC4	.683	.430	.278
	KAC5	.790	.250	.285
	KAC6	.757	.289	.318
	KAC7	.776	.197	.358
	KAC8	.735	.349	.363
Knowledge reconstruction capability	KRC1	.592	.336	.378
	KRC2	.664	.284	.359
	KRC3	.642	.284	.406
	KRC4	.737	.268	.379
Knowledge protection capability	KPC1	.470	.152	.621
	KPC2	.479	.095	.709
	KPC3	.301	.229	.709
	KPC4	.228	.390	.724
	KPC5	.439	.405	.493

Note.
Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.
a. Rotation converged in 7 iterations.

After removing the operating variables KR1, KR4, OC1, OC2, OC3, KRC1 and KPC5, factor analysis is performed again. According to the analysis results, KPC4 with a small coefficient is deleted, and the factor analysis is performed again to obtain the following results (Table 9 and Table 10).Two principal component factors are extracted from the six secondary latent variables under knowledge capability, explaining 67.245% of the total variance.After the maximum variance orthogonal rotation, the load coefficients of all items are greater than 0.6, indicating that the revised scale has ideal discriminant validity.

Table 9

Total Variation of the Structural Factor of Knowledge Capability (2)

Component	Initial eigenvalue			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	Variance %	Accumulative %	Total	Variance %	Accumulative %	Total	Variance %	Accumulative %
1	11.597	61.039	61.039	11.597	61.039	61.039	8.080	42.525	42.525
2	1.179	6.206	67.245	1.179	6.206	67.245	4.697	24.720	67.245
3	.794	4.177	71.422						
4	.678	3.569	74.991						
5	.598	3.150	78.140						
6	.535	2.817	80.957						
7	.487	2.564	83.522						
8	.443	2.331	85.853						
9	.379	1.994	87.847						
10	.348	1.831	89.678						
11	.324	1.707	91.385						
12	.305	1.603	92.988						
13	.285	1.499	94.487						
14	.230	1.210	95.697						
15	.215	1.133	96.830						
16	.204	1.072	97.901						
17	.159	.835	98.736						
18	.131	.691	99.428						
19	.109	.572	100.000						

Note.
Extraction method: principal component analysis

Table 10
The Rotational Component Matrix of the Structure Of Knowledge Capability (1)

Secondary latent variable	operating variable	components	
		1	2
Knowledge resources	KR2	.255	.693
	KR3	.446	.674
Structural capital	SC1	.429	.710
	SC2	.163	.843
	SC3	.387	.707
Knowledge absorptive capacity	KAC1	.666	.463
	KAC2	.684	.394
	KAC3	.706	.441
	KAC4	.662	.548
	KAC5	.772	.371
	KAC6	.763	.407
	KAC7	.804	.335
	KAC8	.763	.456
Knowledge reconstruction capability	KRC2	.722	.365
	KRC3	.720	.388
	KRC4	.784	.378
Knowledge protection capability	KPC1	.731	.214
	KPC2	.786	.139
	KPC3	.628	.256

Note.
Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.
a. Rotation converged in 3 iterations.

2) Confirmatory Factor Analysis

Based onthe exploratory factor analysis, the following model measuring knowledge capability is constructed (Fig.2), and the secondaryconfirmatory factor analysis of the five dimensions constituting knowledge capabilityis performed. The results of model-fitting analysis are shown in Table 11.

Table 11
FittingResults of the Secondary Confirmatory Factor Model for Knowledge Capability

Index	χ^2/df	P	RMSEA	GFI	AGFI	NFI	IFI	TLI	CFI
Value	1.515	0.000	0.067	0.835	0.780	0.888	0.959	0.950	0.958

As can be seen from the above table, theχ^2/df value is less than 3; the RMSEA value is less than 0.08; the GFI and AGFI values are around 0.8; and the IFI, TLI, and GFI values are greater than 0.9. It indicates a moderate degree of fitting,verifying that the present knowledge capability model is basically reasonable.

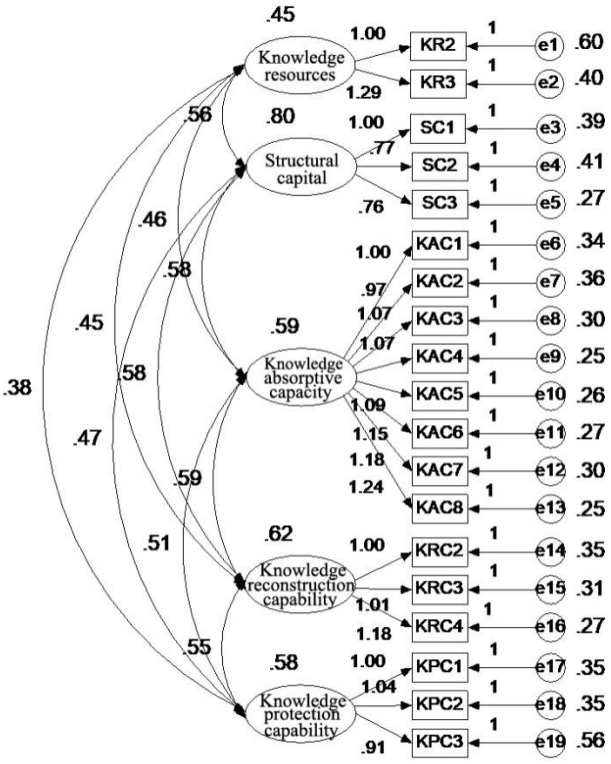

Figure 2 Confirmatory factor analysis of knowledge capability

(2) TheValidity Test of the Subjects'Behavior

1) Structure Validity

The knowledge subjects' behavior consists of three secondary latent variables, namely routine behavior, imitative behavior, and innovative behavior. As can be seen from Table 12, the KMO value is 0.789, which is good; the Bartlett sphericity test value is 335.282. The degree of freedom is 36, and the test significance level (Sig.)is 0.000, indicating that this set of data is suitable for the exploratory factor analysis. The results (See Table 13 and Table 14) are then obtained via the principal component analysis and the maximum variance orthogonal rotation method. Two principal component factorsare extracted from the three secondary latent variables under the knowledge subjects' behavior, the analysis of which explains 58.194% of the total variance. After the maximum variance orthogonal rotation is performed, the load coefficients of each item are all greater than 0.6 (the coefficients of the operative variables RUB2 and IMB2 are slightly less than 0.6, but they are retained according to the reasonablenessof this study), which shows that the discriminant validity of the designed scale is acceptable.

Table 12

KMO and Bartlett's Tests of the Structural Factor of the Knowledge Subjects' Behavior

Kaiser-Meyer-Olkin Measure of Sampling Adequacy		**0.789**
Bartlett's Test of Sphericity	Approx. Chi-Square	335.282
	Df	36
	Sig.	.000

Table 13

Total Variance Explaining the Structural Factor of the Knowledge Subjects' Behavior

Component	Initial eigenvalue			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	Variance %	Cumulative %	Total	Variance %	Cumulative %	Total	Variance %	Cumulative %
1	3.409	37.876	37.876	3.409	37.876	37.876	3.408	37.868	37.868
2	1.829	20.318	58.194	1.829	20.318	58.194	1.829	20.326	58.194
3	.888	9.864	68.058						
4	.819	9.096	77.154						
5	.540	5.999	83.153						
6	.453	5.038	88.191						
7	.438	4.871	93.063						
8	.358	3.979	97.042						
9	.266	2.958	100.000						

Note.
Extraction method: principal component analysis

Table 14

Rotational Component Matrix of the Knowledge Subjects' Behavior

Secondary latent variable	Operating variable	Components	
		1	2
Routine behavior	RUB1	-.767	.129
	RUB2	-.594	.338
	RUB3	-.783	.175
Immitative behavior	IMB1	-.074	.799
	IMB2	.131	.598
	IMB3	-.027	.738
Innovative Behavior	INB1	.823	.161
	INB2	.735	.238
	INB3	.783	.211

Note.
Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.
a. Rotation converged in 3 iterations.

2) ConfirmatoryFactor Analysis

According to exploratory factor analysis, the following model measuring the knowledge subjects' behavior is constructed (Fig.3), and the secondary confirmatory factor analysis of the five dimensions constituting knowledge subjects' behavior is performed. The results of model-fitting analysis are shown in Table 15.

Table 15

Fitting Results of the Secondary Confirmatory Factor Model for The Subjects' Behavior

Index	χ^2/df	P	RMSEA	GFI	AGFI	NFI	IFI	TLI	CFI
Value	1.535	0.045	0.049	0.967	0.939	0.947	0.981	0.971	0.981

As can be seen from the above table, theχ^2/df value is less than 3; the RMSEA value is less than 0.05;and the GFI, AGFI, NFI, IFI, TLI, CFIvalues exceed 0.9. It indicates an ideal degree of fitting,verifying the reasonableness of the model.

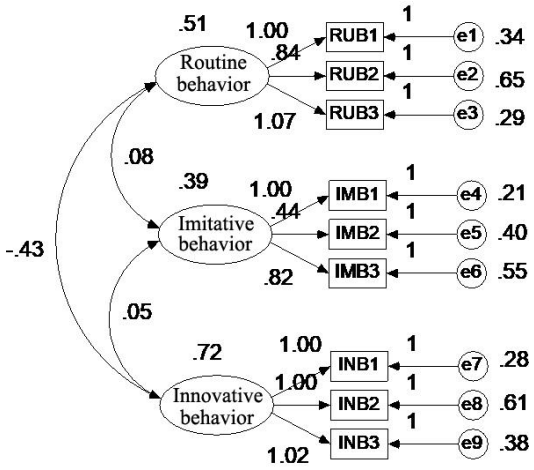

Figure 3 Confirmatory factor analysis of the knowledge subjects' behavior

(3) The Validity Testof Knowledge Flow

1) Conduct validity

Knowledge flow consists of three secondary latent variables, namely knowledge sharing, knowledge creation, and the formation of knowledge advantage.As can be seen from Table 16, the KMO value is 0.870; the Bartlett sphericity test value is 618.033. Moreover,the degree of freedom is 36, and the test significance level (Sig.)is 0.000, indicating that this set of data is suitable for exploratory factor analysis. Then the principal component analysis and the maximum variance orthogonal rotation method are used to achieve the results (See Table 17 and Table 18). Two principal component factorsare extracted from the three secondary latent variables under knowledge flow, the analysis of which explains 70.612% of the total variance.After the maximum variance orthogonal rotation is performed, the load coefficients of all items are greater than 0.6, which shows that the discriminant validity of the designed scale is ideal.

Table 16
KMO and Bartlett's Tests of the Structural Factor Of Knowledge Flow

Kaiser-Meyer-Olkin Measure of Sampling Adequacy		**0.870**
Bartlett's Test of Sphericity	Approx. Chi-Square	618.033
	Df	36
	Sig.	.000

Table 17

Total Variance Explaining the Structural Factor of Knowledge Flow

Component	Initial eigenvalue			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	Variance %	Cumulative %	Total	Variance %	Cumulative %	Total	Variance %	Cumulative %
1	4.939	54.878	54.878	4.939	54.878	54.878	4.316	47.951	47.951
2	1.416	15.733	70.612	1.416	15.733	70.612	2.039	22.661	70.612
3	.636	7.072	77.683						
4	.590	6.559	84.242						
5	.464	5.158	89.400						
6	.329	3.659	93.059						
7	.251	2.791	95.850						
8	.207	2.298	98.148						
9	.167	1.852	100.000						

Note.
Extraction method: principal component analysis

Table 18

Rotational Component Matrix of Knowledge Flow

Secondary latent variable	Operating variable	Components	
		1	2
	KS1	-.267	.732
Knowledge sharing	KS2	-.340	.748
	KS3	.034	.826
	KC1	.772	-.266
Knowledge creation	KC2	.782	-.325
	KC3	.824	-.215
	KA1	.863	-.145
Knowledge advantage formation	KA2	.853	-.073
	KA3	.877	-.112

Note.
Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.
a. Rotation converged in 3 iterations.

2) Confirmatory Factor Analysis

According to exploratory factor analysis, the following model measuring knowledge flow is constructed (Fig.4), and the secondaryconfirmatory factor analysis of the three dimensions constituting knowledge flow is performed. The results of model-fitting analysis are shown in Table 19.

Table 19

Fitting Results of the Secondary Confirmatory Factor Model for Knowledge Flow

Index	χ^2/df	P	RMSEA	GFI	AGFI	NFI	IFI	TLI	CFI
Value	2.753	0.000	0.088	0.947	0.901	0.949	0.967	0.949	0.966

As can be seen from the above table, theχ^2/df value is less than 3; the RMSEA value is less than 0.1 which is acceptable; the GFI,AGFI,NFI,IFI,TLI,CFI values exceed 0.9. It indicates an ideal degree of fitting,verifying that the present model of knowledge flowis reasonable.

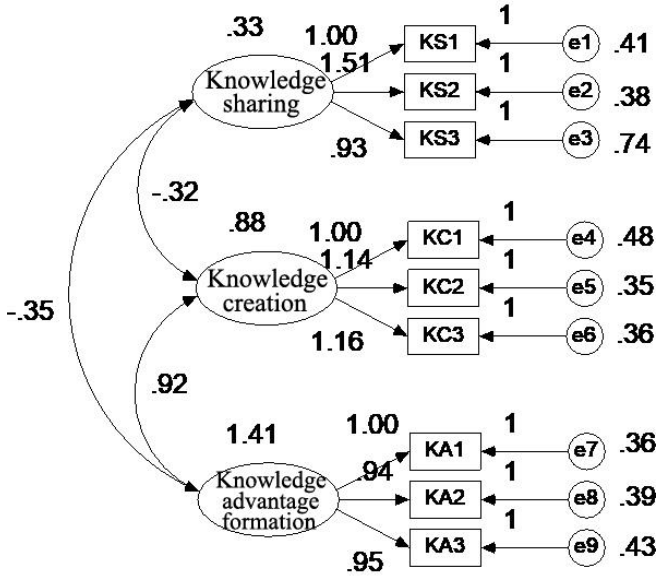

Figure 4 Confirmatory factor analysis of knowledge flow

Regression Results

Using SPSS21.0, the paper first conductsa descriptive statistical analysis of the collected data. In the entire process, the VIF values of collinearity statistics among variables are less than 10.Then through regression analysis, the following multiple linear regression results are obtained (Table 20):

Table 20

Results of Multivariate Linear Regression Analysis

	Model			**Model***		
	Unstandardized coefficients B	t	Sig.	Unstandardized coefficients B	t	Sig.
(Constant)	2.152	7.760	0.000	0.509	0.754	0.451
RUB	-0.229***	-4.693	0.000	0.140	1.241	0.216
IMB	0.101*	1.813	0.071	0.264*	1.965	0.051
INB	0.529***	12.772	0.000	-0.102	-0.865	0.388
KS				0.053	0.384	0.701
KC				0.288	1.603	0.110
KA				0.000	-0.001	0.999
KS×RUB				-0.004	-0.183	0.855
KS×IMB				-0.065**	-2.032	0.043
KS×INB				0.006	0.268	0.789
KC×RUB				-0.056**	-2.483	0.014
KC×IMB				0.039*	1.715	0.088
KC×INB				-0.035*	-1.730	0.085
KA×RUB				0.036*	1.740	0.083
KA×IMB				0.093***	4.490	0.000
KA×INB				0.058***	3.228	0.001
Adjust R^2	0.624			0.967		
F	126.375 (0.000)			438.197 (0.000)		

Note:
*** means p <0.01, ** indicates p <0.05, and * denotes p <0.1

DISCUSSION

It can be seen from Table 20 that prior to the introduction of the moderating variables, there was a significantly positive correlation between the subjects' innovative behavior and their knowledge capability. "r = 0.529" verifies that adopting innovative behavior is beneficial to enhancingthe subjects'knowledge capability. Likewise, the

knowledge subjects' imitativebehaviorwassignificantly positively related to knowledge capability; "r = 0.101" reflects that selectingimitativebehavior assiststhe subjectsto enhance knowledge capability. The knowledge subjects'routine behavior and knowledge capability was significantly negatively correlated before; "r = -0.229"suggests that the knowledge subject' routine behavior is not conducive to enhancing their knowledge capability. The findings above confirm the main hypotheses of this paper. That is, the hypotheses 1a, 1b, and 1c are empirically supported.

After adding the variable of knowledge flow, the paper finds that the interaction between knowledge sharing and imitation has a significantly negative effect on knowledge capability with anadjustment coefficient of -0.065, which indicates that the positive effect of imitative behavior on knowledge capabilityis weakened due to the function of knowledge sharing. Hence, the hypothesis 2b has been empirically supported.Clearly, knowledge sharing facilitates knowledge assimilation among the knowledge subjects, which restricts the "free-riding" effect of imitativebehavior, thereby reducing its positive influenceon knowledge capability.Nevertheless, according to the regression results, the interaction between knowledge sharing, routine behavior, and innovative behavior has no significant effect on knowledge capability; that is, the hypotheses 2a and 2c have not been empirically supported. In other words, the function of knowledge sharing does not play a significant role in mediating the negative impact of routine behavior on knowledge capability.

The interaction between knowledge creation and routine behavior has a significantly negative impact on knowledge capability with an adjustment coefficient of -0.056, indicating that the negative impact of routine behavior on knowledge capabilityis weakened due to the function of knowledge creation. Therefore, the hypothesis 3a is not empirically supported. This empirical result is contrary to the positive adjustment effect of the hypothesis 3a, which reflects that the negative effect is diluted by knowledge spillover generated due tothe routine behavior of the network. Another possible explanation is that because of the function of knowledge creation, a great deal of innovative knowledge is generated in the network. Due to the time lag between knowledge creation and the formation of knowledge advantage, it is usually necessary for the subjects to go through a process of technological innovation to test the real "advantage" of new knowledge from amarket perspective. Given the uncertainty of new knowledge and the risk of technological innovation cost, the subjects' routine behavior is a kind of "risk-avoiding activity" to a certain extent,weakening the negative influence of such behavior on knowledge capability. The interaction between knowledge creation and imitative behavior has a significantly positive effect on knowledge capability with anadjustment coefficient of 0.039, indicating that the positive effect of imitative behavior on knowledge capabilityis enhanced as a result of knowledge creation. Therefore, the hypothesis 3b is empirically supported.In the period of knowledge creation, novel knowledge and technology created through R&D activities may assist the subjects with lower knowledge potential to enhance knowledge capacity and innovation ability via imitative behavior.

The interaction between knowledge creation and innovative behavior has a significantly negative impact on knowledge capability with an adjustment coefficient of -0.035, indicating that the positive impact of innovative behavior on knowledge capabilityis weakened due to thefunction of knowledge creation. Therefore, the hypothesis 3c has also been empirically supported. Obviously, plenty of new scientific knowledge and technologies have been produced through cooperation and innovation among knowledge subjects in the stage of knowledge creation. In this case, compared with highlightingroutine behavior, it is more beneficial for the subjects to adopt innovative behavior, conducting technical innovation and commercializing potential knowledge.

The interaction between knowledge advantage, routine behavior, imitative behavior, and innovative behavior has a positive influence on knowledge capability, and the adjustment coefficientsare 0.036, 0.093, and 0.058, respectively. It shows that when the knowledge network has a comparative

advantage in terms of static knowledge and dynamic knowledge flow, the influence of various types of behavior on knowledge capabilityis significantly enhanced. Hence,the hypotheses4a, 4b, and 4c are empirically supported.When knowledge advantage is developed in the functional evolution of the knowledge network, the entire network has a relatively competitive advantage in terms of the static stock of knowledge and dynamic flow. Hence, the network system presentsa collective effect,and the impacts of the subjects' behavior on their knowledge capability are magnified. It is called the leveragefacilitation impact. Due to the negative correlation between the subjects' routine behavior and their knowledge capability, behavior path dependence is not conducive to the improvement in their knowledge capability (in terms of static resources and dynamic capabilities), which further widens the competitiveness gap between them and other subjects in the network.In terms of the impacts of imitative behavior on knowledge capability,because of numerousexcellent knowledge management experiences, skills,as well as production technologies and methods in the network, economies of scope will be achievedthrough imitative behavior or interactive learning among the subjects. Hence, the positive impacts of imitative behavior on knowledge capability become stronger. In addition, knowledge capability is positively correlated with innovative behavior; that is, knowledge capabilityis improved when the subjects adopt innovative behavior.Theformationof knowledge advantage has a leverage effect on the enhancement of knowledge capability when the subjects select innovative behavior. Moreover, the positive effect ofinnovative behavior on the improvement in knowledge capability is magnified. Accordingly, the test results of thehypotheses are as follows (Table 21):

Table 21

The Test Results of the Hypotheses

Number	Hypothesis	Test results
H1a	The knowledge subjects' routine behavior has a significantly negative impact on their knowledge capability.	Yes
H1b	The imitative behavior of the knowledge subjects has a significantly positive effect on their knowledge capability.	Yes
H1c	The knowledge subjects' innovative behavior has a significantly positive impact on their knowledge capability.	Yes
H2a	Knowledge sharing negatively mediatesthe influence of routine behavior on knowledge capability.	No
H2b	Knowledge sharing negatively mediates the impact of subject's imitative behavior on knowledge capability.	Yes
H2c	Knowledge sharing positively mediates the influence of imitative behavior on the knowledge capability.	No
H3a	Knowledge creation positively mediates the influence of the subjects' routine behavior on knowledge capability.	No
H3b	Knowledge creation positively mediates the influence of the subjects' imitative behavior on knowledge capability.	Yes
H3c	Knowledge creation negatively mediates the influence of innovative behavior on knowledge capability.	Yes
H4a	The formation of knowledge advantage positively mediates the influence of the subjects' routine behavior on knowledge capability.	Yes
H4b	The formation of knowledge advantage positively mediates the influence of the subjects' imitative behavior on their knowledge capability.	Yes
H4c	The formation of knowledge advantage positively mediates the influence of the subjects' innovative behavior on knowledge capability.	Yes

This study has several limitations. First, the questionnaire was only conducted in Chengdu Hi-tech Zone, although the sampleswere derived from heterogeneous organizations, the sample size is not large enough; thus, further could conduct a comparative analysis of different areas. Second, the classificat ion of adaptive behaviors was too mechanical.In the practice of real knowledge network of smokers, due to the complexity and uncertainty of knowledge network, the adaptive behavior is also complex and contingent. This study attempted to explore the law and characteristics of adaptive behavior from a theoretical perspective ofhigh interpretation.

However, the theoretical perspectives used are not uniform, which makes it difficult to clearly 'unify' and 'model' the adaptive behaviors. Based on the evolutionary theory, the adaptive behaviors in our research were classified as '*routine behavior*', '*imitative behavior*' and '*innovative behavior*', although some improvements were made to the existing static research framework, the understanding of the regularity of adaptive behavior was still fragmented and needed further improvement. Third, for the research on the adaptive behavior of knowledge subject under the evolution of knowledge network of smokers, the future should focus on case studies and their expansion in practice, which is also lacking in this study. For example, based on the specific cluster background, the knowledge network of smokers is a sum of formal and informal relationships that are relatively stable and can promote knowledge transfer, which are constructed by various entities or network nodes with rich knowledge resources. They generally have basic functions such as knowledge overflow, flexible aggregation, cluster expansion and trust enhancement.Exploring the law of adaptive behaviors based on the actual case background helps to clarify the practical significance of specific adaptive behaviors,and to enhance the scientific and applied value of research.

CONCLUSION AND IMPLICATIONS

This paperconducts an empirical analysis of the collected data via the statistical analysis softwaresto examine the conceptual models and to test the research hypotheses.The empirical results show that the subjects' routine behavior has a negative impact on the improvement in their knowledge capability, whereasimitative and innovative behavior significantly and positively influences their capability. Moreover, the three stages of knowledge flow have different effects on the enhancement of knowledge capability.More specifically, as for the impacts of routine behavior on knowledge capability, knowledge creationreduces such impact, while the formation of knowledge advantagestrengthens the impact. In light of the influence of the subjects' imitative behavior on their knowledge capability,knowledge sharing and the formation of knowledge advantage negatively mediate such influence, whereas knowledge creationsignificantly and positively mediates the influence. In terms ofthe impact of the subjects' innovative behavior on knowledge capability, knowledge flow significantly strengthens such impact.Generally, in the functional evolution of the knowledge network of smokers, the subjects' behavior at differentstageseither facilitates or constrains knowledge capability.It can be seen that the social network of smokers has an important influence on the evolution of innovation. According to the theory regarding the enhancement of knowledge capability, the knowledge subjects may adopt different behavior strategies to betteradapt to the dynamic environment.

Theoretical Implications

Overall, in the complex and dynamic network environment of smokers, with the rapid development of varioustechnologies and diverse means of communication, the degree of information asymmetry has declined. Routine behavior assists the subjects to avoid competition risks in a short period of time, but in the long term it is not beneficial to the enhancement of knowledge capability. Imitative behavior also helps the subjectsimprove their capability in a short period of time, saving the R&D cost and enhancing the effectiveness of an organization. Although it leads to profit averaging in the long run, which is not conducive to developing the overall competitive advantage of the network, it is still beneficial for fostering the capability of the knowledge subjects. Innovation is asuitable choice for the subjects who seek to develop knowledge advantage or pursue high goals, since such a strategy enables the subjects to obtain more than an average return of remuneration. Hence, adopting innovative behavior in the long run significantly enhances their knowledge capability. The three-phase evolution of knowledge flow mediates the influence of different types of behavior on knowledge capability; however, such moderating role of knowledge flowvaries from one stage to another.

Practical Implications

Different behavioral decisions of knowledge subjects will promote or restrict their own knowledge capabilities,and the smoker enrichment network accelerates this effect. This proposed framework is a pioneering effort in studying what role the knowledge subjects' behavior plays in enhancing their capability in the functional evolution of the knowledge network of smokers.As technology changes and society evolves, the innovation organizations in society continually optimize their decision-making, through the formation of routine or routine-variations, to adapt to the characteristics of macro-environmental development, thereby achieving better development. The social revelation of "*not to advance is to go back*" is further revealed in the conclusions of this study. On the one hand, the knowledge subjects need to keep the driving force of innovation and reform, including through the optimization of public health policies;[38]on the other hand, they also need to examine the impact of the technological evolution of the macro environment on themselves. Choosing the right behavior in an appropriate environment is the optimal choice for operational decision-making. For managers of higher-level organizations or policy makers, the cultivation of a good macro environment should be strengthened. After all, their main expectation is to stimulate higher overall innovation performance output and foster a better innovation atmosphere.

Acknowledgments

This research was supported by grants from the National Natural Science Foundation of China(71602012),Humanities and Social Sciences Fund of the Ministry of Education (21YJC790122), Sichuan Provincial Social Science Planning Project(19JL022), Chengdu Social Science Planning Project (2019BS135), and Philosophy and Social Science Fund Project of CDUT(YJ2020-JX002).

Author Declaration

This research is not funded by any organization related to tobacco production.

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