

Tacit Knowledge Management and Innovation Performance- The Mediating Role of Intellectual Capital

Erwei Han

*School of Economics and Management, Xi'an University of
Technology, Xi'an 710048, Shaanxi, China*

Huifeng Xue

*School of Automation, Northwestern Polytechnical
University, Xi'an 710072, Shaanxi, China*

Yuan Xu

*School of Automation, Northwestern Polytechnical
University, Xi'an 710072, Shaanxi, China*

Ajuan Mu

*School of Leisure Management, Xi'an Eurasia University,
Xi'an 710065, Shaanxi, China*

Abstract

As the society into the era of knowledge economy, the source of innovation performance is increasingly focused on the knowledge level of enterprise. Tacit knowledge helping to obtain the innovation performance is playing an important role the management practice. How to strengthen the tacit knowledge management, thus to improve enterprise innovation performance, has become an important issue of the enterprise management. The paper surveyed 56 enterprises, used structural equation model of AMOS software, and analyzed the positive relationship between the enterprise tacit knowledge and innovation performance. Then this paper explored the mediating effect of intellectual capital between

the tacit knowledge management and innovation performance. Finally, the paper puts forward the building strategy of the enterprise innovation performance based on tacit knowledge management and intellectual capital.

Key words: TACIT KNOWLEDGE MANAGEMENT, INTELLECTUAL CAPITAL, INNOVATION PERFORMANCE, MANAGEMENT STRATEGIES.

1. Introduction

In the Era of knowledge economy, all the enterprises face the changing environment. So, innovation becomes an eternal theme. Innovation performance becomes the focus of attention.

As the comprehensive upgrading of enterprise competition, the core competitive advantage is becoming the key elements to the enterprise competition. If the enterprises want to have the core competitive advantage, they must adhere to innovation, and to achieve innovation performance [1]. Innovation activities can bring to enhance competitive advantage. So how to obtain the innovation performance becomes the top priority of the enterprise management. The competition between the enterprises is the competition of knowledge management ultimately [2]. Knowledge has become the important source of enterprise innovation performance [3]. Given the important role of knowledge for the constructing of enterprise innovation performance, more and more scholars study enterprise innovation performance from the point of knowledge management [4]. Knowledge can be divided into two parts of explicit knowledge and implicit knowledge. Explicit knowledge can be expressed clearly and be transferred everywhere, which is characterized by easy to share. Because of this characteristic, explicit knowledge can be easily acquired by competitors. Explicit knowledge is not enough to become the sustained basis of enterprise innovation performance. And tacit knowledge has unspeakable features [5]. It is not easy to access and imitate by competitors. So it is the important foundation of enterprise innovation performance. From this perspective, it can be concluded that the key of knowledge management is tacit knowledge management, which can help enterprises to obtain and maintain the innovation. Knowledge management and enterprise innovation performance is a hot research topic in the field of enterprise management [6]. But there are not so much research results about the tacit knowledge management and enterprise innovation performance.

In this study, on the basis of existing research results and the empirical analysis, the following problems will be solved: (1) The relationship between the

tacit knowledge management and innovation performance. (2) The mediating effect of intellectual capital between the tacit knowledge management and innovation performance. (3) The relationship between and innovation performance. The significance of this study is to try to open the black box between the tacit knowledge management and innovation performance through the Mediating variable. So, this article picks intellectual capital as mediator, elaborates the important role of tacit knowledge to enhance the level of innovation performance in order to provide assistance for enterprise knowledge management.

2 Theory and hypotheses

2.1 Theoretical analysis

2.1.1 Tacit knowledge

The concept of tacit knowledge is proposed for the first time by Michael Polanyi in the 1950s. He believed that knowledge can be divided into two categories, tacit knowledge and explicit knowledge. Relative to the explicit knowledge, tacit knowledge rooted in the idea of people, behavior, and other fields, which is difficult to be expressed clearly [7]. Since the tacit knowledge concept was put forward, the research results were gradually increased, and deepening. Nonaka considered that tacit knowledge was the source of enterprise innovation to form and continue to keep. Compared to explicit knowledge, tacit knowledge included experience, technical, mental models [8], which played a more important role in building innovation. So the enterprise abilities, such as acquiring, transferring, using tacit knowledge have become the basic ability in building the enterprise innovation [9].

In the study of tacit knowledge dimension, scholars generally classify tacit knowledge as staff, team and enterprise dimensions. Staff tacit knowledge which exists in the individual refers to technical expertise, work experience, and personal traits. Individual difference means the difference of the tacit knowledge. Team tacit knowledge includes team members work mode, work practices, team understanding, team culture. Working in a team become the mainstream mode, team tacit knowledge has an important influence on enterprise innovation. Enterprise tacit knowl-

edge mainly includes enterprise strategy, enterprise culture, organizational communication and working environment [10].

2.1.2 Intellectual capital

The concept of intellectual capital was first proposed by the American economist Galbraith in 1969 [11]. American scholar Stewart first systematically defined the meaning and content of intellectual capital, and he proposed "h-s-c" theory [12]. Intellectual capital included human capital, structural capital and customer capital. Human capital is that individual have the ability to solve the problem and complete tasks; customer capital refers to good relations between enterprise and their customers; structure capital includes enterprise culture, management mode and risk management [13].

2.1.3 Innovation performance

Since Schumpeter firstly put forward the "innovation" concept in 1912[14], the understanding of innovation model has gone from linear mode to technology and market coupling mode, link mode, systems integration and network mode[15]. Innovation performance is the sum of all these changes bought by innovation activities. These changes may appear to profit growth, development of new products or services, improvement of the core competitiveness. This is a comprehensive capability, process and results.

According to the point of OECD (1997) and of Haiyang Li, Kwaku Atuahene Gima (2001) [16], innovation performance, which can be divided into the enterprise innovation effect and innovation efficiency, can be measured by four indicators: the number of enterprise innovative product development over the past three years, sales revenue of innovation product, the number of patents and innovative products sales revenue accounted for the proportion of total sales revenue.

2.1.4 Structural Equation Model and Mediator

Structural equation model is a comprehensive statistical method, which uses variable covariance matrix to analyze the relationship among a number of reasons and results and deals with such variables which cannot be directly observed. This method makes up for the shortcomings of traditional statistical method and has become an important tool for multivariate data analysis. (Judd & Kenny, 1981 ; Baron & Kenny, 1986)

If the variable X affects M by M , M is mediator [17]. Mediating effect means that when the regression has a mediator X only. X and M exists a causal relationship. Variable M and M exists a causal relationship. When the M is put into the regression, the causal relationship between Y and Y is not contin-

ued. So M is complete mediating effect. Otherwise, X is partial mediating effect [18]. At this time, the causal relationship between X and Y remains exist, but it is weakened.

The regression equation is:

$$Y = cX + e_1 \tag{1}$$

Among them, X is the independent variable, e is the dependent variable, e is an error, and coefficient c represents the total effect (Indirect effect and direct effect).

It can be expressed by structural equation model as:



Figure 1. Causal relationship

Doing the regression of Y to M and M , the regression coefficients are b and b . Doing the regression of X to X , it can get the regression coefficients of a . Mediating effect is $a*b$. Test the coefficient a and b . If both of them are significant, $sig < 0.05$, the mediating effect is significant. If the mediating effect is significant and at the same time c' is not significant, it is completely intermediary. The role of independent variable on the dependent variable is completely created by mediator M . If c' is significant, the role is partial mediating effect.

$$M = aX + e_2 \tag{2}$$

$$Y = c'X + bM + e_3 \tag{3}$$

The relationship between the effect:

$$c = c' + ab \tag{4}$$

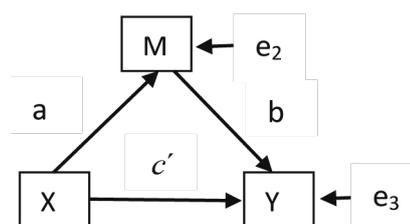


Figure 2. The mediating effect of M

2.1.5 Research Model

According to the above literature research, this paper measures tacit knowledge management from the staff, team and enterprise levels, measures intellectual capital from human capital, structural capital and customer capital dimensions. Then, this paper explores the relationship among the tacit knowledge management, intellectual capital and innovation performance. Research model is shown in Figure 3.

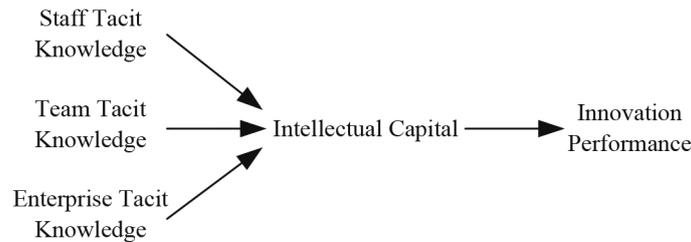


Figure 3. Research model

2.2 Hypotheses

Staff tacit knowledge generally refers to the knowledge and ability of interpersonal skills, experience and know-how, which is embodied in the work, such as product ideas, educational background, professional title, learning ability, ability to change and so on. The tacit knowledge can be internalized into the action of staff, job skills and professional ethics. All of these are the intellectual capital. It can bring innovation in technology, management and customer service, thus can improve enterprise innovation performance. H1: Staff tacit knowledge is related positively to the intellectual capital and innovation performance.

Team tacit knowledge is difficult to imitate and refers to the sense of cooperation tacit knowledge, tacit communication, sharing consciousness and behaviors and so on, which is formed in a team work. For enterprises, the team tacit knowledge does not mean simple the sum of individual tacit knowledge. That is to say that a high level of personal tacit knowledge does not mean the team tacit knowledge level is high. Enterprise only relies on good team to integrate individual tacit knowledge to stimulate innovation activities. H2: Team tacit knowledge is related positively to the intellectual capital and innovation performance.

The foundation of enterprise tacit knowledge is staff tacit knowledge and team tacit knowledge. Likewise, enterprise tacit knowledge is not superimposed on staff tacit knowledge and team tacit knowledge, which is different from the individual and team tacit knowledge because it has its own characteristics. Enterprise tacit knowledge includes enterprise culture, strategic awareness, organizational practices, and so on. Good enterprise tacit knowledge can form different intellectual capital, which can lead to strategic change, process reengineering and innovation atmosphere. H3: Enterprise tacit knowledge is related positively to the intellectual capital and innovation performance.

Intellectual capital refers to the enterprise's intangible assets which can create enormous value. Tacit knowledge is the formation basis of intellectual cap-

ital. Only when tacit knowledge converts into enterprise intellectual capital, can it help enterprises to gain innovation performance and cope with the fierce market competition.

H4: Enterprise intellectual capital plays a role of intermediary between tacit knowledge management and innovation performance.

3 Research design

3.1 Variables and data collection

Combining with the research of the domestic and foreign scholars about the tacit knowledge, intellectual capital and innovation performance, this paper determines the research dimensions, which are the staff tacit knowledge, team tacit knowledge, enterprise tacit knowledge and intellectual capital. The problem of intellectual capital is mainly set from human capital, structural capital and customer capital. The questionnaire uses a five-point Likert. Each question has five response options: Strongly agree, Agree, Neither agree nor disagree, Disagree, and Strongly disagree, and each assignment is Strongly agree with 5 points, Agree with four points, Neither agree nor disagree with 3 points, Disagree with 2 points, Strongly disagree with 1 points. In order to ensure the reliability and validity of the questionnaire, this paper adjusts the questionnaire many times according to the results of the survey of sample companies, uses SPSS18.0 to test the reliability of the questionnaire and tests the fitting and correlation among dependent variables, independent variables, Mediating variable with the aid of Cronbach's Alpha coefficient. Data can be seen from the table, Cronbach's Alpha coefficient of each dimension is above 0.8 which means that the fit of the structural equation and questionnaire reliability are good.

Table 1. Reliability analysis of the questionnaire

Variable	Index	Cronbach's Alpha Coefficient	Composite reliability coefficient
Tacit Knowledge	Staff Tacit Knowledge	0.9175	0.9132
	Team Tacit Knowledge	0.9116	
	Enterprise Tacit Knowledge	0.8902	
Intellectual Capital	Intellectual Capital	0.9012	0.9012
Innovation Performance	Innovation Performance	0.9351	0.9351

3.2 Sample Selection

This article chooses 56 enterprises to get the data with stratified random sampling, to issue 260 questionnaires and to withdraw 210 questionnaires (200 valid questionnaires). The number of withdrawing and valid questionnaires conforms to the requirements of statistics. The population of questionnaire

distributed is representative, considering gender, age, seniority, educational background.

Respondents, which educational background is more than undergraduate, account for more than 85%. This can fully guarantee that the respondents can understand the meaning of tacit knowledge, intellectual capital and innovation performance.

Table 2. Subjects distribution table

Feature	Sample Distribution	Number of samples (person)	Percent (%)
Age	20-30 Years Old	40	20.00
	31—40 Years Old	115	57.50
	41 years old (or more)	45	22.50
Gender	Male	132	66.00
	Female	68	34.00
Educational Background	College (Inclusive)	24	12.00
	Undergraduate	140	70.00
	Postgraduate	36	18.00
Seniority	5 Years (Inclusive)	43	21.50
	6--15 Years	122	61.00
	16 (or More) Years	35	17.50
Position	Non-management Posts	128	64.00
	Management Posts	72	36.00

3.3 Statistical Analysis

After analysis complete mediation model and partial mediation model by AMOS software, this paper

finally selected partial mediation patterns. The analysis data is shown in the table below.

Table 2. Based on the partial mediation model structure equation parameters fitting results

Independent Variable	Dependent Variable	Path Coefficient	Standard Deviation	Critical Ratio	Significance	Hypothesis Testing
Staff Tacit Knowledge	Intellectual Capital	0.325	0.102	1.352	***	Support
Team Tacit Knowledge	Intellectual Capital	0.367	0.132	2.346	***	Support

Enterprise Tacit Knowledge	Intellectual Capital	0.423	0.213	2.369	***	Support
Intellectual Capital	Innovation Performance	0.368	0.156	3.254	***	Support
Staff Tacit Knowledge	Innovation Performance	0.236	0.124	1.289	***	Support
Team Tacit Knowledge	Innovation Performance	0.352	0.135	1.698	***	Support
Enterprise Tacit Knowledge	Innovation Performance	0.412	0.215	3.215	***	Support

Note: * * * indicates significantly below the 0.05 level

From the software analysis data in the table, the hypothesis is valid. Staff, team, enterprise tacit knowledge is positively related with intellectual capital and innovation performance. Intellectual capital is positively related with innovation performance. Intellectual capital plays an intermediary role between the tacit knowledge and innovation performance.

4 Results

The following results can be drawn from the table data: one is that staff tacit knowledge has a larger influence on the intellectual capital and innovation performance. So in staff tacit knowledge management, enterprises should identify the core employees, encourage them to share the tacit knowledge, stimulate innovation activities. Second, team tacit knowledge has a greater impact on the intellectual capital and innovation performance. In team tacit knowledge management, enterprises need to build up good team culture, encourage knowledge sharing among staff and use team incentives, apprenticeship and other models to promote the management level of team tacit knowledge. Third, the enterprise tacit knowledge has a great effect on enterprise intellectual capital and innovation performance. Enterprises need to strengthen the enterprise culture construction, build the learning model organization, so as to realize the promotion of enterprise competitive advantage.

5 Discussion

In the complete mediation model of tacit knowledge, intellectual capital and innovation performance, the staff tacit knowledge, team tacit knowledge and enterprise indirectly affect innovation performance entirely through the intermediary role of intellectual capital. On the basis of fully mediated model, partial mediation model research how staff tacit knowledge, team tacit knowledge and enterprise tacit knowledge have the direct effect on innovation performance.

According to the results, the intellectual capital plays a role of intermediary between tacit knowledge and innovation performance. However, how to measure the intellectual capital accurately in management practice is difficult because the intellectual capital is a stock concept. Are there other mediator? What are these mediators? How do they work?

6 Conclusions

In this paper, a conceptual model of tacit knowledge, intellectual capital and innovation performance is proposed. The tacit knowledge promotes the level of innovation performance through the mediator of intellectual capital.

In the specific path of tacit knowledge management, enterprises should innovate management models and methods from the three aspects of staff, team and enterprise tacit knowledge, increase the intellectual capital stock in order to continuously enhance the level of innovation performance.

Acknowledgements

This work is partially supported by the research projects of Education Department of Shaanxi Province (# 15JK2074), and Thanks for the help.

References

1. Erden Z, Klang D, Sydler R, et al (2014) Knowledge-flows and Firm Performance. *Journal of Business Research*, 67(1), p.p. 2777-2785.
2. Raghu TS, Vinze A (2007) A Business Process Context for Knowledge Management. *Decision Support Systems*, 43(3), p.p. 1062-1079.
3. Golder PN, Shacham R, Mitra D (2009) Innovations' Origins: When, By Whom, and How Are Radical Innovations Developed?. *Marketing Science*, 28(1), p.p. 166-179.
4. Collins HM (1993) The Structure of Knowledge. *Social Research*, 60(1), p.p. 95-116.
5. Jashapara A (2007) Moving Beyond Tacit and

- Explicit Distinctions: a Realist Theory of Organizational Knowledge. *Journal of Information Science*, 33(6), p.p. 752-766.
6. Edvardsson IR, Durst S (2013) The Benefits of Knowledge Management in Small and Medium-sized Enterprises. *Procedia - Social and Behavioral Sciences*, 81(2), p.p. 351-354.
 7. Polanyi M (1967) The Tacit Dimension. *Journal of Information Science*, 63(1), p.p. 47-61.
 8. Nonaka I, Takeuchi H (1996) The Knowledge-creating Company: How Japanese Companies Create the Dynamics of Innovation. *Long Range Planning*, 29(4), p.p. 592-592.
 9. Garavelli AC, Gorgoglione M, Scozzi B (2002) Managing Knowledge Transfer By Knowledge Technologies. *Technovation*, 22(5), p.p. 269-279.
 10. Blackler F (1995) Knowledge, Knowledge Work and Organizations: an Overview and Interpretation. *Organization Studies*, 16(6), p.p. 1020-1046.
 11. Halim S (2013) Statistical Analysis on the Intellectual Capital Statement. *Journal of Intellectual Capital*, 11(1), p.p. 61-73.
 12. Kalkan A, Arman M (2014) The Impacts of Intellectual Capital, Innovation and Organizational Strategy on Firm Performance. *Procedia - Social and Behavioral Sciences*, 150(15), p.p. 700-707.
 13. Serenko A, Bontis N, Booker L, et al (2010) A Scientometric Analysis of Knowledge Management and Intellectual Capital Academic Literature (1994-2008). *Journal of Knowledge Management*, 14(1), p.p. 3-23.
 14. Schumpeter J (2006) The Theory of Economic Development. *European Heritage in Economics & the Social Sciences*, p.p. 61-73.
 15. Winter S, Nelson RR (2002) Evolutionary Theorizing in Economics. *Journal of Economic Perspectives*, 16(2), p.p. 0-46.
 16. Li H, Gima KA (2001) Evolutionary Theorizing in Economics. *The Impact of Interaction Between R&d and Marketing on New Product Performance: an Empirical Analysis of Chinese High Technology Firms*, 21(1), p.p. 61-75.
 17. Judd CM, Kenny DA (1981) Process Analysis estimating Mediation in Treatment Evaluations. *Evaluation Review*, 16(2), p.p. 602-619.
 18. Baron RM, Kenny DA (1981) The Moderator-mediator Variable Distinction in Social Psychological Research: Conceptual, Strategic and Statistical Considerations. *Journal of Personality & Social Psychology*, 16(2), p.p. 1182-1173.



METAL
JOURNAL

www.metaljournal.com.ua