The Types of KM Strategies in Manufacturing Firms

Jong-Min Choe

***Abstract*—Based on the usage levels of target costing systems (TCS) and information technology (IT) infrastructure, this study aimed to develop a framework useful for classifying four types of knowledge management (KM) strategies in manufacturing firms: explorative, exploitative, mixed and negative. The framework was developed and suggested. We also empirically confirmed the framework that proposes four types of KM strategies in manufacturing firms.**

***Index Terms*—KM strategies, target costing, IT infrastructure, personalization, codification**

I. Introduction

In prior research, two alternative approaches to knowledge management (KM) were suggested; codification and personalization. A codification strategy is an approach that seeks to obtain and store knowledge in explicit form for subsequent use and transfer or sharing by employees [3]. A personalization approach, on the other hand, seeks to link people to each other to communicate and share knowledge across the organization in tacit or explicit form. It is generally accepted that information technology (IT) infrastructure, such as a database or electronic repository, search engines and intelligent filters, supports the implementation of a codification strategy [6]. Compared to the codification approach, the personalization strategy requires a moderately low degree of usage of IT infrastructure for the sharing and communication of tacit knowledge [4]. To support the flow and sharing of tacit knowledge, other systems or mechanisms that assist the implementation of a personalization strategy are required. In manufacturing firms, target costing systems (TCS) may be considered as the cross-departmental mechanisms that can support the realization of a personalization strategy [7]. The types of KM strategies can be decided and developed based on the usage degrees of KM instruments, such as IT infrastructure for the codification and TCS for the personalization [9]. Thus, in this study, based on the usage levels of IT infrastructure and TCS, we suggest a framework that is useful to identify the kinds of KM strategies in manufacturing firms.

II. Theoretical Underpinnings

A. Elements of a Personalization Strategy

The personalization approach, which mainly supports the creation, transfer and sharing of tacit knowledge, comprises diverse elements or means, such as interpersonal interactions and communication, personal experience and job rotation [1]. Since new knowledge creation involves the sharing of existing knowledge by individuals, it is inherently a group process. The physical interactions and communication among group members represented by the organizational practice of forming task forces or working teams are a means for organizations to pool and share tacit knowledge of their members. The sharing of tacit knowledge is also affected by the extent to which members have experience with the task and the training they receive [1]. Diverse groups whose members possess different explicit or tacit knowledge due to variations in their backgrounds, training or experiences are more likely to share their various unshared knowledge than homogeneous groups composed of similar members. Nonaka [10] proposed that the members of an organization should shift repeatedly among several physical settings (e.g., lab and plant), because the experiences of employees in diverse settings contribute to the development of organizational or group redundancy. The organizational redundancy helps to create a common cognitive ground among employees, and thus, facilitates the transfer or sharing of tacit knowledge. Job rotation or exchanges between functions such as R&D and Marketing is a mechanism to promote the formation of organizational redundancy. Nonaka indicated the importance of the role of key middle managers for the creation and synthesis of tacit knowledge in company teams. When a firm's traditional categories of knowledge no longer work, they suggest a fresh way to think about things or a new sense of direction, which stimulates the creation of new tacit knowledge by employees.

B. Characteristics of Target Costing Systems

Target costing is applied in the developing and designing stages of a product. In the execution of TCS, the physical interactions among members of many departments are essential. TCS are normally applied in the product development style characterized as simultaneous engineering or 'rugby' style product development. 'Rugby' style development demands continuous involvement of members of related departments, and produces conditions which give rise to knowledge creation [10]. In the target costing process, the functional manager who is responsible for a stage in product development should influence the activities of the functional managers of the subsequent and preceding stages to achieve, through cooperation, the targets of costs and quality, and the timely introduction of new products to the market. Product planning and cost meetings in TCS are the devices used to promote interactions among functional managers or members of various departments. They are, therefore, very important for simultaneous engineering to work effectively. Through interactions, members of many departments can share knowledge and values. To increase the diversity in experience, members of the product planning meetings are rotated through several functional departments before being named to the product

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planning committee. TCS integrate diverse functions in business, stimulate interactions and communication among important functions, and permeate the planning process of a firm. In Table I, the characteristics of TCS are compared with the elements of a personalization approach.

TABLE I: PERSONALIZATION APPROACH AND TCS

Elements of a personalization approach	Characteristics of TCS
. Interactions among members	. Interactions among members of various departments
. Smooth communication	. Smooth communication through meetings and face-to-face interactions
. Diversity in background, training and personal experiences	. Diversity in experiences of members
. Job rotation	. Job rotation of members
. Key middle managers	. Chief engineer responsible for new product committee . Continuous involvement of related members

C. IT Infrastructure and Codification Strategy

In the codification strategy, various kinds of knowledge are codified and stored in the firm's memory system, and ultimately, treated as a structural asset owned by the firm. IT infrastructure that generally supports the realization of a codification strategy is classified into three broad types; knowledge storage (memory), search and transfer or cooperation infrastructure [5]. IT infrastructure for knowledge storage utilizes a common database or electronic knowledge repository that stores codified and text-based knowledge as well as video, audio and graphics. The search infrastructure helps knowledge seekers to locate and retrieve requisite codified knowledge. It includes IT tools such as powerful search engines and intelligent filters. The transfer and collaboration infrastructure are employed to communicate information or knowledge between individuals, and to promote the cooperation among employees of the firm and other related firms, as well as the learning of members of the organization [9]. To electronically exchange codified knowledge between individuals, e-mail and other Internet-based technologies are used.

III. A FRAMEWORK FOR THE TYPES OF KM STRATEGIES

The types of KM strategy can be decided, formed and identified based on the usage degrees of KM instruments [8]. KM tools are broadly classified into two main groups: technological (e.g., IT infrastructure) and non-technological instruments (e.g., TCS). The choice of KM instruments also must depend on the firm's strategic orientation to KM. Thus, the use degrees of KM instruments in an organization and the kinds of KM strategy adopted by a firm are closely related. In this study, it is suggested that to implement and activate KM in manufacturing firms, both TCS and IT infrastructure can be adopted, since striking differences exist between the roles of TCS and those of IT infrastructure in KM. According to the adoption degrees of the TCS or IT infrastructure, manufacturing firms may pursue different kinds of KM strategies. Thus, based on the usage levels of the TCS and IT infrastructure, a framework that represents forms of KM strategy can be developed and proposed. Fig. 1 shows the framework and the four types of KM strategies in manufacturing firms: explorative, exploitative, mixed and negative KM strategies.

A. The Explorative KM Strategy and the Exploitative KM Strategy

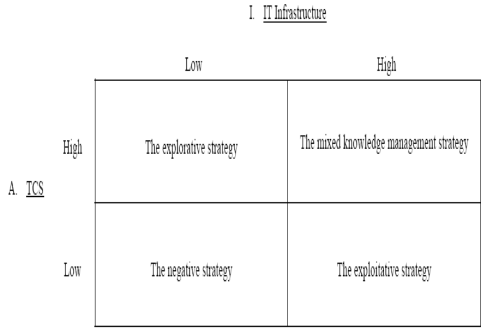

Fig. 1. A Framework for knowledge management strategies

The explorative strategy in manufacturing firms primarily uses TCS, and stresses a personalization approach in KM. To the extent that knowledge in the industry is changing quickly, the company needs to be creating new knowledge just to keep pace. In this situation, the organization must employ the explorative KM strategy to acquire new knowledge, which is required to become and to remain competitive in its strategic condition. The exploitative KM strategy mainly depends on the use of IT infrastructure, and emphasizes the codification approach for KM. When knowledge resources and capabilities of a firm are sufficient for satisfying the knowledge requirements in an organization, the exploitation strategy can be employed. Under this strategy, companies put more emphasis on codifying, storing and reusing an enormous amount of knowledge

B. The Mixed KM Strategy and the Negative KM Strategy

The mixed KM strategy stresses both personalization and codification methods, and thus, it is integrative and aggressive approach in KM. It depends on TCS to acquire new types of tacit knowledge as well as IT infrastructure to exploit various kinds of explicit one. The exploration of novel knowledge and the exploitation of present one are not mutually exclusive. While existing knowledge is applied in practical works, new one also must be produced to respond to continuous knowledge demands in an organization. The manufacturing firms employing the negative KM strategy have little interest in KM. Both TCS and IT infrastructure are not positively used for managing knowledge, and thus, it

is not managed in a systematic manner.

IV. Data Collection and Measurements

Data for this study were drawn from a survey of the current status of TCS and IT infrastructure used in Korean manufacturing firms. In total, 330 organizations were randomly selected from a population of about 1,000 firms that are listed on the Korean stock market. In order to collect data, this research both administered questionnaires and conducted interviews with the participating firms. The survey was conducted during a 4-month period between September and December 2009.

TABLE II: Sample Characteristics

Type of industry	Chemical industry	Machine industry	Auto-mobile	Electronic industry	Textile	Food	Paper & pulp	Non-metal	Metal industry	Rubber	Total
No. of firms	19	20	21	22	8	8	4	16	10	2	130

No. of employees	Below 100	100 - 300	300 - 500	500 - 1,000	1,000 -	Total
No. of firms	12	31	35	24	28	130

The distinctive features of TCS include: cooperation of many departments, collaboration with suppliers, use of value engineering and cost table, consideration of corporate planning, and emphasis on the developing and design phases of a product. Ten questionnaire items were developed with these characteristic features. The usage degree of TCS was measured on a seven-point Likert-type scale that ranged from 'not at all' to 'to a great extent'.

Types of IT infrastructure are grouped into three kinds: the transfer or cooperation, storage and search infrastructure. Based on previous studies [2], the 13 question items were constructed to measure the adoption and usage levels of IT infrastructure. For the transfer or cooperation IT, the 6 items were used. The two items, which measure the storage infrastructure, comprise the clear rules and procedures for knowledge classification, and the use of database or data warehouse to store knowledge. The five items used for measuring the search IT represent the usage of IT to seek for new knowledge, to find out the location of an individual and the specific area of database for obtaining knowledge, and to retrieve knowledge about firm's products and markets or competition.

V. Empirical Evidence of the Four Types of KM Strategies

Based on the values of TCS, the storage and transfer IT, and the search infrastructure, a cluster analysis was performed to find four clusters of organizations. A formal approach in determining the most appropriate number of clusters is to examine the distance coefficient. The distance coefficient is presented in Table 3. The distance coefficient increases greatly at three points - between the fifth and sixth clusters, between the fourth and fifth clusters, and between the third and fourth clusters. To show various cases in the combination of the usage levels of TCS and IT infrastructure, the six-cluster solution can be selected. The mean values of variables within each cluster are presented in Table IV.

TABLE III: Distance Coefficients of Cluster Analysis

Stage	120	121	122	123	124	125	126	127	128	129
Coefficient	91.4	99.0	108.3	118.7	132.3	152.3	172.8	215.4	288.2	468.2
Increasing rate of coefficient	-	8.7%	9.0	9.0	11.0	15.0	13.0	25.0	33.0	62.0

TABLE IV: Results of Cluster Analysis

Clusters	A (N=32) mixed strategy	B (N=11) exploitative strategy	C (N=18) explorative strategy	D (N=27) mixed strategy	E (N=38) mixed strategy	F (N=4) negative strategy	χ^2
Target costing	5.0(3)	3.0(5)	4.5(4)	5.2(2)	5.9(1)	2.9(6)	80.4 [a]
Storage & transfer IT	4.6(4)	4.9(3)	3.6(5)	5.8(1)	5.8(1)	2.2(6)	87.2 [a]
Search IT	4.7(3)	4.4(4)	3.1(5)	4.9(2)	5.9(1)	1.8(6)	90.0 [a]

The numbers are mean values, and the numbers in parentheses are rankings. a: $p<0.01$, b: $p<0.05$, c: $p<0.1$.

Since, in this study, a seven-point Likert-type scale was used for the measurements of TCS and IT infrastructure, the middle score (i.e., four-score) can be employed as the common dividing point, with which the usage levels can be roughly classified into two groups: high and low. In the cases of clusters A, D and E, the mean values of TCS and IT infrastructure are higher than the middle point. Thus, clusters A, D and E may represent the firms that prefer the mixed KM strategy. In terms of cluster B, the mean of TCS is lower, but those of IT infrastructure are higher than the

middle score. Accordingly, the B shows the manufacturing firms adopting the exploitative strategy. However, in the case of cluster C, the mean value of TCS is higher, but those of IT infrastructure are lower than the middle point. The firms of cluster C may prefer and pursue the explorative KM strategy. In cluster F, the mean values of TCS and IT infrastructure are remarkably lower than the middle score. Thus, cluster F indicates the manufacturing firms adopting the negative strategy. Fig. 2 shows the location of each cluster on the grid of usage levels of TCS and IT infrastructure.

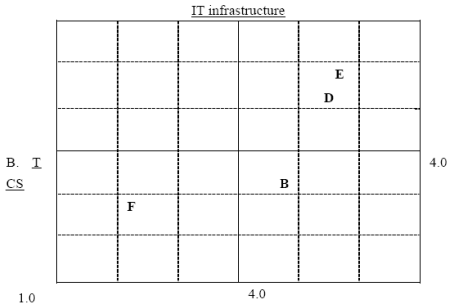

Fig. 2. Location of each cluster on the grid

REFERENCES

[1] Z. Erden, G. Krohg, and I. Nonaka, "The quality of group tacit knowledge," *Journal of Strategic Information Systems*, vol. 17, no. 1, pp. 4-18, 2008.

[2] H. Gold, A. Malhotra, and H. Segars, "Knowledge management: An organizational capabilities perspective," *Journal of Management Information Systems*, vol. 18, no. 2, pp. 185-214, 2001.

[3] E. Greiner, T. Bohmann, and H. Krcmar, "A strategy for knowledge management," *Journal of Knowledge Management*, vol. 11, no. 1, pp. 3-15, 2007.

[4] M. Jasimuddin, "Exploring knowledge transfer mechanisms: The case of a UK-based group within a high-tech global corporation," *International Journal of Information Management*, vol. 27, pp. 294-300, 2007.

[5] D. Ko, J. Kirsch, and R. King, "Antecedents of knowledge transfer from consultants to clients in enterprise system implementations," *MIS Quarterly*, vol. 29, no. 1, pp. 59-85, 2005.

[6] R. Kuo and G. Lee, "KMS adoption: the effects of information quality," *Management Decision*, vol. 47, pp. 1633-1651, 2009.

[7] T. W. Lin, K. A. Merchant, Y. Yang, and Z. Yu, "Target costing and incentive compensation," *Journal of Cost Management*, vol. 19, no. 1, pp. 29-42, 2005.

[8] R. Maier and U. Remus, "Implementing process-oriented knowledge management strategies," *Journal of Knowledge Management*, vol. 7, no. 1, pp. 62-74, 2003.

[9] M. Mohamed, A. Murray, and M. Mohamed, "The role of information and communication technology (ICT) in mobilization of sustainable development knowledge: a quantitative evaluation," *Journal of Knowledge Management*, vol. 4, no. 6, pp.744-758, 2010.

[10] I. Nonaka, "A dynamic theory of organizational knowledge creation," Organization Science, vol. 5, no. 1, pp. 14-37, 1994.