Towards a contingency approach to knowledge sharing practices of project teams when encountering changes in project scopes

Wei-Tsong Wang, TAIWAN[1*], Nai-Yuan Ko, TAIWAN[1]

[1]Dept. of Industrial and Information Management, National Cheng Kung University, Taiwan

*Email Address of Contact Author: wtwang@mail.ncku.edu.tw

Abstract

The impact of unexpected changes in new product development (NPD) project scope on the performance of project teams cannot be overlooked in today's complex business environment in which project owners' requests and expectations change constantly. The results of a recent literature review indicate that successful knowledge sharing practices can lead to the development of competitive advantages of a project team by enhancing individuals' abilities of coordination and problem solving. On the other hand, undesired consequences may occur if the knowledge cannot be effectively shared among the team members. Nevertheless, there have been very few studies engaging in exploring the knowledge sharing mechanisms used and the contingency factors affecting the application of these mechanisms in the context of NPD projects with unexpected change in scopes. Consequently, in this study the knowledge sharing mechanisms used by project teams and the contingency factors affecting the use of these mechanisms when encountering changes in the NPD project scopes are explored by conducting an in-depth case study. The findings can help NPD project teams examine their abilities to harness critical knowledge, and, in turn, develop effective methods to share it in order to enhance NPD project performance.

Keywords: Knowledge sharing; contingency approach; project; change in scopes

1. Introduction

The impact of unexpected changes in project scope on the performance of project teams, in terms of project cost, schedule, and quality, cannot be overlooked in today's complex business environment in which project owners' requests and expectations change constantly. Under such circumstances, project teams tend to encounter stress-inducing situations in which critical decisions must be made in a timely manner based on limited information in order to ensure favorable project performance.

Although research indicates that the key to enabling effective knowledge sharing (KS) in project teams is to let the experts talk to each other, this is a difficult task to accomplish in practice, particularly in a time-stressed decision-making context.

Undesired consequences, such as the reduction in the work efficiency of the project team, increases in the probability of the failures of new product development (NPD) projects, and unreasonable project delays, may occur if the knowledge cannot be effectively shared among the team members. Nevertheless, there have been very few studies engaging in exploring the KS mechanisms used and the associated contingency factors in the context of NPD projects with unexpected disturbances.

Consequently, this study aims to specifically explore the knowledge sharing mechanisms used by project teams and the contingency factors affecting the use of these mechanisms when encountering changes in the NPD project scopes By conducting an in-depth multiple-case study. The findings of this study can help NPD project teams develop effective KS methods to enhance NPD project performance.

2. Literature Review

2.1. Knowledge sharing

Knowledge sharing (KS) can be defined as a set of activities in which knowledge is transferred/distributed from specific individuals, groups, and organizations to others [14]. The results of the literature review indicate a number of primary research perspectives for comprehending knowledge sharing, such as learning [5], knowledge market [19], knowledge flow [7], and communications/interaction [21].

What connects these perspectives is the interaction perspective. Knowledge can be shared not only through structured media, such as documents, but also through informal and/or formal interpersonal interactions [5, 12]. With reference to the classic distinction of tacit and explicit knowledge [20], KS practices tend to rely on four modes of interpersonal interactions [21, 22]: socialization (tacit to tacit); externalization (tacit to explicit); combination (explicit to explicit); and internalization (explicit to tacit). To conclude, the core of KS is the perception that knowledge must be continuously moving throughout a group/organization so that it can be reused, and recombined to create new knowledge in order to generate its potential benefits. This can be done by utilizing various social and technical systems and processes that facilitate human interactions [7].

2.2. KS practices in NPD projects with changes in scope

Projects are proven challenging to plan and manage because of their conditions and performance evolve/change over time as a result of environmental turbulence [18]. The NPD projects, which is defined as the complete process of bringing a new product from idea to market [11], have drawn significant attention of researchers. Very few NPD projects have succeeded because of the dynamic nature of key success factors, including time, cost, quality, and, in particularly, scope [28]. For example, changes in project scope often lead to significant schedule and/or cost overrun as a

result of unexpected reworks and additional tasks, redesign of work processes, or re-allocation of resources [15]. Additionally, as scope changes often occur during the course of the NPD projects and cause significant impacts on the progress of the projects, researchers have conducted and/or called for research that aims to explore and examine the indicated issues [18, 28].

There has been a significant body of studies related to the KS in the context of project management [9, 13]. A consensus is that individual team members do not have all of the knowledge a project requires and must acquire the knowledge needed via effective means in order to accomplish productive work. Existing studies that focus on investigating KS in NPD project teams have conducted using various approaches and/or based on various perspectives, such as action research approach [13], communication/networking perspective [1, 23], social capital perspective [3], and risk management perspectives [26, 27]. However, empirical or theoretical studies that investigate how KS factors influence the management of the NPD projects undergoing unexpected changes in scope using a contingency approach are rare.

2.3. The contingency approach

The contingency approach has been widely adopted in various kinds of management literature, and has been an underlying theme for theory building [25]. The contingency approach emphasizes the importance of choosing the most suitable management systems by taking into consideration critical contingency factors, including corporate strategy, structures, and culture. To elaborate on this argument, it is worth noting that the essential premise of the contingency approach is that effectiveness, which can be broadly defined as organizational adaptation and survival, can be achieved in more than one way, which implies that universal principles for management excellence may not exist [30]. Effectiveness depends on the appropriate matching of contingency factors with internal organizational structures that enable appropriate response to the uncertainty and changes in the environment [34]. This study thus adopts a contingency approach to achieve our research objectives.

3. Research Methodology

3.1. Research design

In this study the method of in-depth case study is adopted with reference to the logic of the grounded theory [29]. The use of the grounded theory will be further addressed later along with the data analysis procedures.

This study uses a step-by-step process [2]. The first step is to identify the key contingency factors and the KS mechanisms used by project teams by reviewing the existing literature on relevant domains such as PM, KS, and group learning. The second step is to conduct archival data analysis on a research-based department to

further evaluate the suitability of the identified contingency factors and the KS mechanisms, and then to group and modify them based on the results of the analysis. The third step is to conduct a case study of two research-based departments to investigate the relationships between the contingency factors and the KS mechanisms.

3.2. Data collection

To ensure the *construct validity* of this study [33], three procedures were conducted. First, data for this study are collected from multiple sources for the purpose of carrying out data triangulation [16]. The data sources were as follows: (a) data from 17 semi-structured, face-to-face personal interviews with executives, middle-level managers, and employees with non-managerial positions, each lasted from 40 to 120 minutes; and (b) documents from participating organization, including memos, personal notes, work logs, and meeting minutes. Second, before the data collection processes officially begin, the sample interview questions, data collection protocols, and data analysis techniques to be used are sent to a number of professionals with expertise relevant to this study for their evaluation. Finally, three pilot interviews with two informants are conducted to further validate the interview instruments.

3.3. Data analysis

This study adopts the grounded theory approach [29], which can be summarized by the following characteristics. First, the researchers engaged in data analysis while collecting data. This practice allows the researchers to gradually adjust the orientation of their data collection procedures based on the improving understanding of the research topic, which makes the collected data become more focused. Second, the two-stage method of analytic coding is adopted for the data coding process [17]. In the first stage of initial coding, the data collected is examined line by line in order to identify statements that are related to the study. When initial coding is completed, the second stage of focused coding begins, in which the codes are sorted and categorized based on their conceptual similarities. In this stage codes that are considered irrelevant or relatively less productive are discarded. The remaining codes are then reexamined for future analysis.

Third, the researchers used an inductive method in order to identify and develop theoretical reasoning for the critical themes relevant to the research topic, while simultaneously grounding this reasoning in empirical observations or data. These themes were then further analyzed using the technique of pattern matching in order to ensure *internal validity* [33]. The fundamental logic of this technique is to compare an empirically-based pattern or a rival pattern with one or multiple-predicted patterns [31], and then to appropriately explain and organize what is observed from the collected data. Fourth, the external validity of this study was ensured by the use of cross-case comparisons. Findings across the three cases in this study are compared to

determine whether or not they share similar characteristics. Finally, the validity of the findings is checked through three follow-up interviews.

4. Research Results

Results acquired from the first two research steps indicate that multiple means through which knowledge is shared among individuals in NPD projects are identified and categorized into three main KS mechanisms as follows: communities of practice, documentation, and mentoring systems (see Table 1). Additionally, multiple factors that influenced KS practices are found and grouped into three key contingency factors as follows: knowledge categorization and indexing, management style, and level of task complexity (see Table 2).

Table 1. Knowledge Sharing Mechanism Used in NPD Projects

Knowledge Transfer Channel	Definition and references
Communities of practice	Formal or informal groups where individuals come together for common purposes or interests and share information and knowledge with one another [5, 8].
Documentation	A set of activities of transforming, coding, and preserving the expertise of employees in the forms of paper-based documents in filing cabinets or electronic files in computer information systems for reference and reuse by other employees [5, 6].
Mentoring systems	A mechanism in which a mentor (an individual who is relatively experienced) conducts a set of activities for a mentee (an individual who is relatively inexperienced) in which the mentor monitors and coaches the mentee's practice in order to help the mentee do a job more effectively and/or to progress in his or her career [5, 21].

Table 2. The Contingency Factors Influencing KS Practices in NPD Projects

Contingency factor	Sample supporting argument and references
Knowledge categorization and indexing	Effective knowledge management in project-based organizations involves interventions which reflect various ways of appropriately embedding knowledge within organizational systems and processes [4].
	Better indexing of knowledge enables effective search for the knowledge needed and hence drive the success of NPD projects [10].
Management style	Teams with better communication (i.e. KS ability) are more likely to have better project performance, and thus organizations may benefit from creating contexts that encourage such

	communication [24].
	Project team members who exhibit different attitudes and behaviors regarding interpersonal coordination (i.e. knowledge sharing) have different preferences for management styles [32].
Level of task complexity	A higher degree of complexity regarding working and innovating in a group has the potential to create a situation where knowledge sharing is hampered [9].
	The changes in scope would result in competence (e.g., knowledge) loss of the project staffs due to the decreasing human interactions [3, 28]

5. Conclusion

With intent to highlight the importance of performing effective KS practices during the progress of NPD projects that encounter unexpected and/or disturbing changes in scope, this study explores the knowledge sharing mechanisms used to share and use critical knowledge and the contingency factors associated with these KS mechanisms by conducting an in-depth case study of three research-based departments of two organizations. The research findings can help managers better examine their strengths and weaknesses in terms of handling the disturbances of their NPD projects, and then make appropriate strategic choices to match their resources, such as knowledge, with their project goals. This, in turn, can help them develop useful knowledge sharing mechanisms for facilitating the generation of effective measures to appropriately manage the potential disturbances of their future NPD projects.

The next step of this study is to further analyze the data collected in order to explore the relationships between the identified KS mechanisms and key contingency factors in order to provide more insights into future planning that can facilitate knowledge sharing for managing NPD projects. Thus, this study will advance our understanding of KS practices within NPD project teams when encountering changes in project scopes, and, in turn, enables future researchers to further develop a programmed body of research on this topic.

6. Acknowledgements

7. Reference

[1] Adenfelt, M. (2010). Exploring the performance of transnational projects: Shared knowledge, coordination and communication. *International Journal of Project Management*, 28(6), 529-538.

[2] Ahn, J. H., Lee, D. J., & Lee, S. Y. (2006). Balancing business performance and knowledge performance of new product development: Lessons from ITS industry. *Long Range Planning*, 39(5), 525-542.

[3] Bakker, M., Leenders, R. Th. A. J., Gabbay, S. M., Kratzer, J., & van Engelen, J. M. L. (2006). Is trust really social capital? Knowledge sharing in product development projects. *Learning Organization*, 13(6), 594-605.

[4] Bresnen, M., Edelman, L., Newell, S., Scarbrough, H., & Swan, J. (2003). Social practices and the management of knowledge in project environments. *International Journal of Project Management*, 21(3), 157-166.

[5] Davenport, T. H. & Prusak, L. (1998). *Working Knowledge: How organizations manage what they know*. Boston, MA: Harvard Business School Press.

[6] Grover, V. & Davenport, T. H. (2001). General perspectives on knowledge management: Fostering a research agenda. *Journal of Management Information Systems*, 18(1), 5-21.

[7] Gupta A K. & Govindarajan, V. (2000). Knowledge flows within multinational corporations. *Strategic Management Journal*, 21(4), 473-496.

[8] Haslam, S. A., Eggins, R. A., & Reynolds, K. J. (2003). The ASPIRe model: Actualizing social and personal identity resources to enhance organizational outcomes. *Journal of Occupational and Organizational Psychology*, 76(1), 83-113.

[9] Hong, H. K., Kim, J. S., Kim, T., & Leem, B. H. (2008). The effet of knowledge on system integration project performance. *Industrial Management & Data Systems*, 108(3), 385-404.

[10] Jian, G., Gao, J., & Wang, Y. (2010). A multi-agent based knowledge search framework to support the product development process. *International Journal of Computer Integrated Manufacturing*, 23(3), 237-247.

[11] Kahn, K. B. (2005). *PDMA handbook of new product development (2nd ed.)*. New York, NY, John Wiley and Sons.

[12] Kim, Y. G., Yu, S. H., & Lee, J. H. (2003). Knowledge strategic planning: methodology and case. *Expert Systems with Applications*, 24(3), 295-307.

[13] Koskinen, K. U. (2000). Tacit knowledge as a promoter of project success. *European Journal of Purchasing & Supply Management*, 6, 41-47.

[14] Lee, J. N. (2001). The impact of knowledge sharing, organizational capability and partnership quality on IS outsourcing success. *Information and Management*, 38(5), 323-335.

[15] Lee, S. & Pena-Mora, F. (2007). Understanding and managing iterative error and change cycles in construction. *System Dynamics Review*, 23(1), 35-60.

[16] Lincoln, Y. S. & Guba, E. G. (1985). *Naturalistic inquiry*. Beverly Hills, CA: Sage Publications.

[17] Lofland, J., & Lofland, L.H. (1995). *Analyzing social settings: A guide to qualitative observation and analysis (3rd ed.)*. Belmont, CA, Wadsworth Publishing Company.

[18] Lyneis, J. M. & Ford, D. N. (2007). System dynamics applied to project management: a survey, assessment, and directions for future research. *System Dynamics Review*, 23(2/3), 157-189.

[19] Matson, E., Patiath, P., & Shavers, T. (2003). Stimulating knowledge sharing: Strengthening your organization's internal knowledge market. *Organizational Dynamics*, 32(3), 275-285.

[20] Nonaka, I. (1994). A dynamic theory of organizational knowledge creation. *Organization Science*, 5(1), 14-37.

[21] Nonaka, I. & Takeuchi, H. (1995). *The Knowledge-creating Company: How Japanese companies create the dynamics of innovation*. New York, NY, Oxford University Press.

[22] Nonaka, I., Toyama, R., & Konno, N. (2000). SECI, Ba, and leardership: A unified model of dynamic knowledge creation. *Long Range Planning*, 33(1), 5-34.

[23] Peters, L. D. & Fletcher, K. P. (2004). Communication strategies and marketing performance: An application of the Mohr and Nevin framework to intra-organisational cross-functional teams. *Journal of Marketing Management*, 20(7-8), 741-770.

[24] Pons, D. (2008). Project management for new product development. *Project Management Journal*, 39(2),82-97.

[25] Porter, M. (1980). *Competitive Strategy*. New York, NY: The Free Press.

[26] Regev, S., Shtub, A., & Ben-Haim, Y. (2006). Managing project risks as knowledge gaps. *Project Management Journal*, 37(5), 17-25.

[27] Richtner, A. & Ahlstrom, P. (2010). Organizational slack and knowledge creation in product development projects: The role of project deliverables. *Creativity and Innovation Management*, 19(4), 428-437.

[28] Rodrigues, L. L. R., Dharmaraj, N., & Rao, B. R. S. (2006). System dynamics approach for change management in new product development. *Management Research News*, 29(8), 512-523.

[29] Strauss, A. & Corbin, J. (1997). *Grounded theory in practice*. Thousand Oaks, CA, Sage Publications.

[30] Tosi, H. R. Jr. & Slocum, J. W. (1984). Contingency theory: Some suggested directions. *Journal of Management*, 10(1), 9-26.

[31] Trochim, W. (1989). Outcome pattern matching and program theory. *Evaluation and Program Planning*, 12(4), 355-366.

[32] Turner, R., Ledwith, A., & Kelly, J. (2010). Project management in small to medium-sized enterprises: Matching processes to the nature of the firm. *International Journal of Project Management*, 28(8), 744-755.

[33] Yin, R. K. (2003). *Case study research: Design and methods (3rd ed.)*. Thousand Oaks, CA, Sage Publications.

[34] Zeithaml, V. A., Varadarajan, P., & Zeithaml, C. P. (1988). The contingency approach: Its foundations and relevance to theory building and research in marketing. *European Journal of Marketing*, 22(7), 37-63.