

Apply Knowledge Management Value Chain Perspective in New Product Development Performance: A Conceptual Framework

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ABSTRACT

Due to the advances in science and technology and the rapid changes in the market, a product's life cycle has become much shorter than before. A new product development (NPD) strategy is an important activity that helps enterprises to survive and make continuous improvements. Most enterprises have now placed great emphasis on shortening the time for a new product coming into the market. The aim of this paper is to explore the relationship among knowledge management value chain (KMVC), new product development NPD performance, and NPD strategy. Apply the qualitative research as methodology to do this research. The result found that KMVC has positive related to NPD performance, and NPD strategy.

Keywords: Knowledge Management Value Chain, New Product Development

INTRODUCTION

Due to the advances in science and technology and the rapid changes in the market, a product's life cycle has become much shorter than before. A new product development (NPD) strategy is an important activity that helps enterprises to survive and make continuous improvements. Therefore, firms have adopted knowledge management (KM) method and NPD strategy to emphasize how shortens the time for a new product coming into the market. In our investigation, purpose was considered in terms of encouraging KM in NPD projects. As such, this article goes beyond a large and growing literature on KM pertaining to the capturing, locating, transferring, and sharing of primarily existing knowledge (von Krogh *et al.*, 2000).

The new product's invention become the most important part in any kinds of companies, however the invention should base upon the knowledge, in the other word, knowledge is the foundation of the new product's invention. How to apply the current knowledge to invent new product and let this kind of action more efficient, and also maintain the new product can be more useful and acceptable in the market in order to avoid the cost of fail in new product invention could be one of the important issue in the invention of new product (Hansen *et al.*, 1999). Otherwise, from the process of the new product's invention also involves professional knowledge, sharing of creativity coordination. Those factors have to utilize the knowledge management this perspective to integrate. This aim of this paper is to explore the correlation among KM activity, NPD and NPD performance (Hansen *et al.*, 1999; von Krogh *et al.*, 2000).

KNOWLEDGE MANAGEMENT

Knowledge is one of the critical assets to leverage when pursuing enterprise competitive advantage (Lee and Choi, 2003; Sharkie, 2003). Nonaka and Takeuchi (1995) proposed that knowledge creation was generated by the interaction of tacit knowledge and explicit knowledge. DeLong and Fahey (2000) developed a useful framework to classify knowledge, which distinguished among human, social, and structured knowledge. Human knowledge is what humans know or know how to do. Social knowledge is usually tacit knowledge that arises out of relationships. An example of social knowledge is the way employees at different levels in the employment hierarchy interact with other employees (e.g. a cutter and a finisher versus a cutter and a manager). Structured knowledge is rooted in the systems, processes, rules, and routines of an organization and is usually explicit knowledge. Many organizations are now

engaging in KM in order to leverage knowledge both within their organization and externally to their customers and suppliers (Rubinstein- Montano *et al.*, 2001). KM is an emerging field which is a matter of grave concern of academic and industry. Scarbrough (1998) discusses that the knowledge-based view of a firm focuses on fostering specialization of employees knowledge and on creating internal networks of these human knowledge sources, while business process reengineering focuses on external relationships for rapidly growing performance complemented by generalization of the knowledge source.

KNOWLEDGE MANAGEMENT VALUE CHAIN

Knowledge activities are dynamic as well as humanistic with active and subjective natures created by social interactions dependent on individuals, their community and organization interactions, and applicability to needs (Holsapple and Joshi, 2002). Shin *et al.* (2001) purposed that the KMVC reflects sociology of knowledge. Tsoukas (1996) indicates that individual knowledge is built up by social practices engaged in by the individual; therefore, the two kinds of knowledge are highly interdependent. Thus, the value chain can be used to explain to some degree social knowledge and its interactions with individual knowledge. It is essential that the KMVC should be strategically driven in order to realize the objectives of an organization, and resulting in a continuously cycling process.

KMVC activities can be thought of as a structured coordination for managing knowledge effectively. Typically, knowledge processes include activities such as creation, sharing, storage, and usage. Whereas knowledge processes represent the basic operations of knowledge, enablers provide the infrastructure necessary for the organization to increase the efficiency of knowledge processes. Organizational performance may be defined as the degree to which companies achieved its business objectives. It may be measured in terms of organizational learning, profitability, or other financial benefits in KM. Without measurable success, passion from employees and managers will vanish.

NEW PRODUCT DEVELOPMENT

Clark and Wheelwright (1993) viewed the NPD process as information processing. Four steps are involved during NPD: first conception generation, converting the information required by the customer into a conception statement; second, product planning, development performance, cost, form, and other objectives per the product conception; third, product engineering, converting the product objectives into detailed drawings; and fourth, manufacturing engineering, designing the work flow, tools/equipment, procedures for part processing, etc., per the engineering drawings. Harris and Helfat (1997) indicate the subset of the competences or capabilities which allow the firm to create new products and processes and respond to changing market circumstances. Technological or knowledge transfer and linkages within the company, the interface and information sharing among group members especially R&D, marketing and manufacturing are very important for the success of NPD. Gary *et al.* (2000) pointed out that NPD where one technological platform can lead to families of products, and learning must be transferred from one team to the next. Some companies excel at transporting knowledge between teams, and then capitalizing on it. In order to clarify content of NPD strategy and performance will be discussed.

NEW PRODUCT DEVELOPMENT STRATEGY

Clark *et al.* (1987) viewed the NPD process as information processing. Four steps are involved during NPD: first, conception generation, converting the information required by the customer into a conception statement; second, product planning, development performance, cost, form, and other objectives per the product conception; third, product engineering, converting the product objectives into detailed drawings; fourth, manufacturing engineering, designing the work flow, tools/equipment, procedures for part processing, etc., per the engineering drawings. Cooper (1984a, b) proposed the NPD should have four variables while we concerning a NPD strategy. First, the enterprise to a new product: This includes creating a new product, developing a better product for meeting the customer's demand than that of competitors, and product concentration and differentiation. Second, market characteristic adopted by the new

product which contain the characteristics for a new market, customers, competitors and new sales channels. Third, the enterprise's technological orientation and commitment, which includes the percentage of research and development (R&D) expense to sales amount, company's R&D orientation. Fourth, technological characteristic adopted by the new product, which includes more advanced and complicated technologies, closely matched with the company's R&D resources, technical maturity and concentration. Firth and Narayanan (1996) defined a NPD strategy as having three aspects new embodied technology; new market applications and innovation in the market. Based upon these three aspects, his conducted the definition for a new product development strategy which include innovators; investors in technology; searching for new markets; business as usual; middle-of-the-road. Barczak (1995) divided NPD strategy into three categories based on Ansoff and Stewart's classification: first to market, fast follower and delayed entrant. Song and Montoya-Weiss (1998) utilized Ansoff's product market matrix model considering the growing in our current market and technology strategy. The results lead to incremental NPD. Veryzer (1998) point out two important aspects: technological capability and product capability. Technological capability means that a product must be made using a technology beyond the current company technology level. Product capability represents the benefit of a product recognized or experienced by customers.

NEW PRODUCT DEVELOPMENT PERFORMANCE

Sixotte and Langley (2000) thought that cross department horizontal communication and information exchanges could greatly decrease the uncertainty in new product development and improve new product development performance. Calantone *et al.* (1995) proposed new product development activities for enterprise performance and strategy. He utilized the ratio of investment (ROI) and the investment growth rate (GROI), ratio of sales (ROS) and sales growth rate (GROS) and market share and growth rate as performance measurement indexes. Dwyer and Mellor (1991) investigated the relationship between the implementation integrity for new product development activities and new product development performance from 96 manufacturers. In their research four subjective-measurement indexes were used to evaluate if new product development was success. The four indexes contained assessment of the overall success or failure; profit level; sales goal; and opportunities that could be brought by the new product in the future. Getting people to work on cross-functional teams does not necessarily mean that they adequately share the knowledge required for integrated problem solving. So the processes need to be monitored and their performance measured. Process performances measure the effectiveness of the product development process itself (Hong *et al.*, 2004).

Cooper and Kleinschmidt (1996) proposed the performance map to measure the performance. They also adopt profitability and impact these two elements concluded and indicated ten performances which contained as following:

- Success rate: The proportion of development projects that became commercial successes.
- Percentage of sales by new products: The percentage of the business unit's sales accounted for by new products introduced within the last three years.
- Profitability relative to spending: How profitable the business unit's total new product efforts were, relative to the amount spent on them.
- Technical success rating: How successful the total effort was from a technical/technological perspective.
- Sales impact: How strong an impact the total new product effort had on the business unit's top line or sales revenues.
- Profit impact: How strong an impact the effort had on the business unit's bottom line or annual profits.
- Meeting sales objectives: The extent to which the total new product effort met the business unit's sales objectives for new products.
- Meeting profit objectives: The extent to which it met the business unit's profit objectives.
- Profitability versus competitors: How profitable the total new product effort was relative to competitors.
- Overall success: All things considered, how successful the business unit's total new product efforts were when compared to competitors.

Based upon the previous studies and literature once can indicate the KMVC, NPD strategy and NPD performance have the relationship but lacking the complete structure to show their relationship. Therefore, in order to let those three various having a clear structure to indicate their relationship. In this paper, we proposed follow propositions.

KMVC AND NPD PERFORMANCE

Susan *et al.* (2003) point out the NPD is influenced by the knowledge behaviors which also have impacts on knowledge outcomes and organizational effectiveness. Because knowledge is increasingly important to competitive advantage (Seely-Brown and Duguid, 2000), firms focus on their generating competencies of knowledge. By contrast, tacit knowledge is difficult to articulate and access because it is usually developed based upon experience, action, feeling, and so on, and thus can only be shared through direct interactions (McFadyen & Cannella, 2004; Tsai, 2001; Tsang, 2002). In the literature of managing knowledge organization has dealt with some issues about knowledge enterprise such as organizational memory (Cross and Baird, 2000), knowledge transfer (Szulanski, 1996), the design of technology tools for knowledge sharing (Davenport and Prusak, 1998), and strategies of developing knowledge (Zack, 1999). Studies of KM and innovations draw substantial attention to how knowledge is created, acquired, shared, and diffused within an organization in strategic decision making and execution (McFadyen & Cannella, 2004; Turner & Makhija, 2006).

However, the impacts of these elements depend on what and how features the organizations used, in particular for performance of NPD (Dougherty, 1995). Thus, according to the previous studies and literatures above once we formulate as our first proposition:

Proposition 1: The processes of KMVC (knowledge creation, knowledge storing, knowledge distribution, and knowledge application) are positively related to NPD performance.

KMVC AND NPD STRATEGY

Clark and Wheelwright (1993) divided knowledge integration into interior and exterior parts. The combination of these two could increase new product performance. Tsoukas. (1996) placed emphasis on the importance of knowledge integration and thought that business owners must effectively acquire and integrate external knowledge to develop innovative ideas. Moorman (1995) pointed out that an enterprise with a good capability to absorb market information would reduce market uncertainty (namely external knowledge management), and obtain comparatively high success opportunities.

NPD strategy concerns issues related to access the technology for NPD. Choices companies have for access to organization's technology is to build their own technology, buy from a technology supplier or acquire another company in order to gain access to its core brand or core technology. Technological or knowledge transfer and linkages within the company, the interface and information sharing among group members especially R&D, marketing and manufacturing are very important for the success of NPD. The accumulated experience, knowledge, and information flow of R&D, marketing and manufacturing play an important role in NPD. Experience of each functional specialist is one of the principal ways for accumulated knowledge. Each project team encounter greater difficulty, take longer time and have fewer alternatives when they have no previous experiences with the task especially when a product concept is relatively new and unfamiliar to an organization (Olson *et al.*, 1995). Lynn *et al.* (2000) pointed out that NPD where one technological platform can lead to families of products, and learning must be transferred from one team to the next. Some companies excel at transporting knowledge between teams, and then capitalizing on it. Knowledge is increasingly important to competitive advantage (Seely-Brown & Duguid, 2000), firms focus on their generating competencies of knowledge. In the literature of managing knowledge organization has dealt with some issues about knowledge enterprise such as organizational memory (Cross & Baird, 2000), knowledge transfer (Szulanski, 1996), the design of technology tools for knowledge sharing (Davenport & Prusak, 1998), and strategies of developing knowledge (Zack, 1999). Clark and Wheelwright (1993) pointed out that a NPD strategy is an information processing procedure, i.e. good knowledge management arrangement. The intention to engage in NPD is to decrease the uncertainty in the course of NPD. However, the impacts of these elements depend on what and how features the organizations used, in particular for performance of NPD (Dougherty, 1995). Enterprises with good knowledge management methods will have successful NPD performance, we propose following proposition:

Proposition 2: The factors of KMVC (knowledge creation, knowledge storing, knowledge distribution, and knowledge application) are positively related to NPD strategy.

MARKET ORIENTATION AND NPD PERFORMANCE

Kotabe (1990) concluded in his research that the product innovation level has a direct relation to performance, for example, the higher product innovation level, the better performance. Davis (1988) investigated three NPD cases with seven activities proposed by Booz, Allen and Hamilton, among which two are failed and one succeeded. Both the two failed indicates that omitting the important developing activities, product test, will lead to failure. While another succeeded case for new product in a hotel is mainly due to implementation of product development activities step by step. Cooper (1984a, b) found that in the following seven NPD activities, the successful cases had complete implementation activities. The failed cases omitted important activities, such as: creation filtration, market research and product prototype tests using customers. Hise *et al.* (1989) concluded in their studies that a company that performs its operations without a specific procedure or lacking a complete development schedule would decrease its success rate for NPD and entry to market.

Homburg and Pflesser (2000) indicated behavioral and cultural perspectives as two market orientation. Behavioral market orientation described specific behaviors related to the generation and dissemination of market intelligence and firm's responsiveness. On the other hand, cultural market orientation described how culture creates an environment for learning about markets and for sharing information among functions in the organization to allow for taking coordinated actions.

*Proposition 3: Difference in market orientation for NPD has significantly affect NPD performance.
Knowledge as dynamic capability in New Product Development*

DYNAMIC CAPABILITIES AND NPD PERFORMANCE

Teece and Shuen (1997) define Dynamic Capabilities (DCPs) as 'the firm's ability to integrate, build, and reconfigure internal and external competences to address rapidly changing environments'. In this conception, non-dynamic capabilities change through the action of DCPs. The aforementioned literature stresses the importance of DCPs; however, other recent related studies have provided an even greater contribution to the understanding of the concept. DCPs are dedicated to the modification of operational capabilities and lead, for example, to changes in the firm's products or production processes. This classification has increasingly been adopted in recent models of DCPs (Helfat & Peteraf, 2003; Zahra & George, 2002; Zahra *et al.*, 2006) and helps to eliminate the tautological flavor associated with dynamic capabilities. As Helfat and Peteraf (2003) explain, 'DCPs do not directly affect output for the firm in which they reside, but indirectly contribute to the output of the firm through an impact on operational capabilities'. At the same time, they urge that while some capabilities may deal specifically with adaptation, learning, and change processes, all capabilities have the potential to accommodate change. Learning, change, and adaptation do not necessarily require the intervention of DCPs as intermediaries. Zahra *et al.* (2006) distinguish substantive DCPs ability to change or reconfigure existing substantive capabilities, which term as the firm's DCPs. Thus, the qualifier 'dynamic' distinguishes one type of ability (e.g. the substantive ability to develop new products) from another type of ability (e.g. the ability to reform the way the firm develops new products).

According the DCPs view of the firm, in the changing of the operation environment superior performance depends on the ability to recognize critical changes and on the process of renewing the firm's knowledge based and capabilities. Here, we adopt Zahra *et al.* (2006) perspective to view DCPs as the processes to reconfigure a firm's resources and operational routines to recognize critical changes and on the process of renewing the firm's knowledge based and capabilities. Through KMVC which are the foundation for improvements in the way firms operate. Hence,

Proposition 4: Dynamic capabilities reconfigure the firm's knowledge process and consequently, change how organizational members do thing. The renewal of NPD in order to create or respond to market change has significantly affect NPD performance.

CONCLUSION AND IMPLICATIONS

This study based upon creation, storage, distribution, and application these four value chain which proposed from Shin *et al.* (2001) to explore how to lead the KMVC into the new product invention's activities which utilize in the KMVC. Overall from the previous studies and literature once can find that those four KMVC's activities were widely applied in the new product invention. However, the results showed KMVC has positive related to NPD performance, and NPD strategy. Overall, we could apply the KMVC as tool to integrate the NPD performance, and NPD strategy. By the way, this paper also could utilize the finding into the reality companies to help product development manager achieved to shorten the time for a new product coming into the market which they made.

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