Performance-Oriented Knowledge Management Methodology

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Abstract

In this paper, we develop a performance-oriented knowledge management methodology to evaluate and eventually improve the contribution of knowledge to business performance In order to find the causal linkage between knowledge and performance, we utilize product and process concepts as intermediaries and then construct a knowledge-intensive production function Through the analysis of the production function, we estimate the marginal contribution of knowledge to performance and derive the managerial implications for the effective knowledge management activities

1. Introduction

Despite the widespread recognition of the importance of knowledge, it is not so obvious to measure and nurture knowledge so that contribution of knowledge is linked toward an explicit business performance improvement. In practice, in a survey of 431 U.S. and European organizations, about half of the respondents responded that "generating new knowledge" and "accessing valuable knowledge for external sources" are most important to a firm's success, but that one of the most difficult obstacles they face in practice is "measuring the value and performance of knowledge asset" (Ruggles, 1998). Therefore, measuring and valuing knowledge is absolutely necessary for the successful implementation of knowledge management.

In this paper, we develop a performance-oriented knowledge management methodology to evaluate and eventually improve the contribution of knowledge to business performance. In order to find the causal linkage between organizational knowledge and business performance, we utilize product and process concepts as intermediaries and then construct a knowledge-intensive organizational production function. A new knowledge classification scheme is developed using product and process as a new dimension, and incorporated it into the production function. Through the analysis of production function, we estimate the marginal contribution of knowledge to performance and derive the managerial implications for effective knowledge management activities

Major problem for the knowledge management was the difficulty of measuring the contribution of knowledge. The methodology developed in this paper addresses the important assessment issue, and thereby will be an important theoretical framework for the effective knowledge management activities.

2. Literature Review

Regarding the studies on performance-orientation, much attention has been made to link production and management activities more directly to market and the performance therein. One line of studies (Kaplan and Norton, 1992, 1993) stressed the balanced view among various business performances as a prerequisite for a firm's success, while others (Narver and Slater, 1990; Glazer, 1991; Hunt and Morgan, 1995; Yeung and Berman, 1997; Becker and Huselid, 1998; Rogers, 2001) focused on the conditions that the organizational resources and activities should be met for a superior performance

Two apparently different, but complementary views are worth noting here. One line is the view by Glazer (1991), Narver and Slater (1990) and Hunt and Morgan (1995). They stressed the importance of marketing orientation, which is defined as a combined set of knowledge-intensive activities like the systematic gathering of information on customers and competitors, both present and potential, the systematic analysis of the information for the purpose of developing market knowledge, and the systematic use of such knowledge to guide strategy recognition, understanding, creation, selection, implementation, and modification.

The other view, which focused on the human resources, is the one by Yeung and Berman (1997), Becker and Huselid (1998) and Rogers (2001). As for the conditions of human resources contributing to business performance, they indicated a well-established cohesive human capital asset base, learning capability, group identification and commitment, peer monitoring and pressure, and their balanced performance orientation toward employee, customer and shareholder satisfaction.

Despite this handful of studies on performance-orientation, it is only recently that several attempts were made to relate explicitly organizational knowledge to business performance in the framework of knowledge management (Decarolis and Deeds, 1999; Ahn and Chang, 2002). One reason might be the intrinsic difficulty of knowledge measurement, but the other reason would be the lack of learning process on how the knowledge-intensive production process works and how it is connected to organizational and market performances.

3. Approach

A recent study by Ahn and Chang (2002) suggested a framework for valuation of knowledge, called the KP^3 methodology. Even though it can be considered a quite new idea, the problems such as knowledge classification and assessment of the linkage matrices have to be resolved for real applications. In the following, we further develop the KP^3 methodology, while addressing the above problems.

3.1. KP^3 Methodology

The basic building blocks of the KP^3 methodology consist of four components: Knowledge, Process, Product, and Performance. Knowledge is further classified into two: product knowledge and process knowledge. Performance is further classified into market performance and organizational performance. Figure 1 shows the overview of the KP^3 methodology.

Product knowledge and process knowledge are the inputs to the production process. In the process, they are transformed into organizational and market performances.

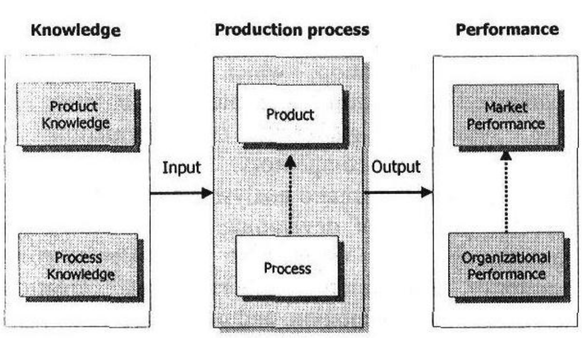

Figure 1. Overview of the KP^3 methodology

3.2. Product and Process for Measuring the Knowledge Contribution

Recent studies emphasized that organizational knowledge is the key resource for competitive advantage and identified the relationships between organizational knowledge and business performance. Vekstein (1998) and Decarolis and Deeds (1999) empirically tested the relations between knowledge and performance with proxy macro-variables in the firm level for automobile and biotechnology industries. Compared to the previous studies, Ahn and Chang (2002) made progress in a sense that they build up a knowledge-to-performance framework in the organizational level. However, knowledge classification and suggested linkage of knowledge to performance was not clear yet.

This requires more specificity in terms of the definition and classification of knowledge and the mechanism with which knowledge is created, stored, transferred, integrated, and transformed into performance within and across organizations. In the following, we introduce a new dimension of product and process as a vehicle to understand the linkage of knowledge to performance more explicitly.

Knowledge

According to Nonaka and Konno (1998), knowledge is created in a knowledge platform emerged in individuals, working groups, project teams, informal circles, temporary meetings, e-mail groups, and at the front-line contact with the customer. According to them, two typical forms of knowledge are created and shared among organizational members. Explicit knowledge is a type of knowledge which can be formed and expressed as data, scientific formulae, specifications, manuals and the like, while tacit knowledge is another type which is highly personal and hard to formalize like subjective insights, intuitions and hunches.

Our performance-oriented view of knowledge management classifies knowledge into four categories using product and process as the entities of the second dimension, in addition to the first dimension of knowledge type (tacit and explicit knowledge). Figure 2 depicts our knowledge classification scheme. It is different from the conventional one in that it provides us with a vehicle to relate knowledge to performance via product and process as intermediaries.

	Tacit	Explicit
Product	Know-how (Human brain)	Knowledgebase (Knowledge repository)
Process	Human capability (Human brain and culture)	Workflow (Workflow system)

Figure 2. Different types of knowledge

In a knowledge-intensive firm, product is the explicit output of the production process in the organization, while process is the procedure which transforms information and knowledge inputs into an explicit output in an efficient way. Hence, product knowledge tends to be more object-oriented, focused on a specific product, while process knowledge is relatively more collective. Referring to Nonaka and Konno (1998)'s terminology, tacit product knowledge constitutes the technical dimension, while tacit process knowledge shapes the cognitive dimension

Specifically, we can associate the four categories of knowledge with more concrete forms As shown in figure 1, *tacit product knowledge* is product-specific *know-how* that cannot be easily expressed, and it resides in the human brain. On the other hand, *tacit process knowledge* is human *capability* that enables the efficient production process, and it resides in the human brain and culture Regarding the explicit knowledge, *explicit product knowledge* is the *knowledgebase* accumulated in a knowledge repository focusing on a specific product. *Explicit process knowledge* is *workflow* embedded in an IT-based workflow system.

Knowledge-intensive Production Function

The term "*knowledge-intensive*" imitates economists' labeling of firms as capital-intensive or labor-intensive. By analogy, labeling a firm as knowledge-intensive implies that knowledge is more important than other inputs (Starbuck, 1992). Starbuck (1992) insisted that "*one should not label a firm as knowledge-intensive unless exceptional and valuable expertise dominates commonplace knowledge*"

In our knowledge categorization, product knowledge is a "stock" kind of knowledge which is accumulated somewhere in human brain and knowledge repository, while process knowledge is organizational capability which activates the knowledge flow and the interactions among the various kinds of knowledge stocks so as to get better output and performance Our view, which stresses the importance of balance between knowledge stock and flow, is in the same spirit as the one by Decarolis and Deeds (1999), though the level of analysis greatly differs.

We can consider knowledge an exogenous variable in the production process, facilitates the transformation process of labor and capital into the desired output and should be regarded as a third explicit input factor. However, more aggressive view of the knowledge-intensive firm is that labor itself should be regarded as knowledge or capability embedded in the human brain From this perspective, human capital should be managed as knowledge stock and capability that individuals have accumulated through knowledge activities in their careers Then, the output of the production process can be represented by a Cobb-Douglas production function as

$$Q = \theta K^{\beta} C^{\gamma} . \qquad (1)$$

, where Q, C and K represent the output, capital and knowledge respectively.

In this paper, we would further assume capital as given or exogenous to the production function In the following, we will show how the product and process framework can be used to understand the links between knowledge activities and business performance, and to estimate the contribution of knowledge activities to business performance

4. Valuation of Knowledge to Performance

Figure 1 shows the conceptual view of how knowledge contributes to performance through product and process as intermediaries. However, the challenge is how to evaluate it in an explicit way To handle the problem, we use the production function approach as demonstrated in equation (1).

Let's define *knowledge input* as the total amount of knowledge used in the production process for a certain period of time. Then, it can be represented by "*knowledge input*" = "*knowledge stock level*" × "*work period*". Let's denote K_i (i = 1, ..., 7) as the knowledge *input* for i-th generic knowledge entity. Suppose that the first three are product knowledge entities, while the last four are process knowledge entities. Then, the primary goal is to identify the knowledge production function of the form

$$Q = \alpha \prod_{i=1}^{7} K_i^{\beta_i} , \qquad (2)$$

, where α represents θC^{γ} in equation (1)

In the above knowledge production function, Q denotes the output of the production process and α measures the productivity of knowledge to the output, given that the other input factors are fixed

Regarding the Cobb-Douglas type production function in equation (2), we can make two important observations. First, we can measure organizational and market performance with the linear combinations of generic knowledge stock levels Though the knowledge production function in (2) is in a multiplicative form, we can transform it into an additive form. That is, by taking a natural log (ln) on both sides of the equation (2), we obtain

$$lnQ = ln\alpha + \sum_{i=1}^{7} \beta_i \, lnK_i \qquad (3)$$

This also implies that a linear combinations of each knowledge stock levels can be used to estimate the organizational and market performance.

Second, we can interpret the meaning of coefficient β_i (i=1, …, 7). By differentiating both sides of the equation (2), we get

$$\frac{dQ}{Q}=\beta_i\frac{dK_i}{K_i} \quad \text{or} \quad \beta_i=\frac{dQ/Q}{dK_i/K_i} \qquad (4)$$

Equation (4) shows that β_i is the marginal contribution of generic knowledge entity i to performance, or the elasticity of performance to knowledge. This result gives us an idea of how we can empirically evaluate the contribution of knowledge to performance using analytic tools such as regression modeling approach.

5. Implementation of Performance-Oriented Knowledge Management

Using knowledge measurement as input factors to the production process and performance measurement as output from the production process, the contribution of knowledge to performance can be evaluated either at the product division or team level Using this understanding, KM activities are initiated pursuing better organizational and/or financial performance. Typical KM activities include knowledge performance comparisons across teams or divisions, evaluation of a knowledge worker's fitness for a specific job based on his or her potential contribution, and human resource allocation across teams. Eventually KM activities would make the production process more efficient through the product and process innovations.

The most important, and distinctive step of our KM process is the one for assessing the contribution of knowledge to performance which was described briefly in the previous section. More detailed discussion is available in Chang and Ahn (2002).

6. Conclusion

For the successful implementation of knowledge management activities, it is necessary to measure the impact of knowledge to business performance for organizational support In this paper, we developed a performance-oriented knowledge management methodology, or KP^3 methodology, to evaluate the contribution of knowledge and eventually aim to improve business performance.

In the methodology, the "product and process" concept was used to make a logical link between knowledge and performance. With the concept, we developed a new knowledge classification scheme and emphasized to focus on the tacit product and process knowledge rather than explicit product and process knowledge Then, a production function was defined to show that organizational and market performance can be represented by a linear combination of knowledge stock levels of a team weighted by the marginal contribution of the knowledge to performance. Also, it can be demonstrated that the marginal contribution of knowledge to performance can be empirically estimated through regression analysis. For detailed discussion, see Chang and Ahn (2002).

The methodology developed in this paper would provide important theoretical background for the study of knowledge management. Further, the clear understanding of the knowledge contribution to performance would guide all the knowledge management activities in more efficient ways

References

Ahn, J H , and Chang, S G Valuation of knowledge· a business performance-oriented methodology *Proceedings of the 35th Hawaii International Conference on System Sciences*, 2002.

Barney, J B , and Wright, P M On becoming a strategic partner The role of human resources in gaining competitive advantage *Human Resource Management*, 37, 1 (1998), 31-46.

Becker, B. E., and Huselid, M. A. High-performance work systems and firm performance· A synthesis of research and managerial implications. In G. R Ferris (eds), *Research in Personnel and Human Resource Management*, 16, pp 53-101, Greenwich, CT JAI Press, 1998

Bohn, R E Measuring and Managing Technology Knowledge *Sloan Management Review*, 36, 1(1994), 61-74

Chang, S G and Ahn, J. H , Performance-Oriented Knowledge Management, Invited paper for Journal of Management Information System (2002b).

Connelly, M S and et al Exploring the relationship of leadership skill and knowledge to leader performance *Leadership Quarterly*, 11, 1 (2000), 65-86.

Day, G S The capabilities of market-driven organizations *Journal of Marketing* 58, 4 (October 1994), 37-52

DeCarolis, D M., and Deeds, D S The impact of stocks and flows of organizational knowledge on firm performance· An empirical investigation of the biotechnology industry. *Strategic Management Journal*, 20, (1999), 953-986

Note: Other references are omitted because of the space limit They would be available upon request