전략적 과제에 대한 지식기반의 의사결정

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Knowledge-based Decision Making on Strategic Problems

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ABSTRACT

In recognizing knowledge as a new resource in gaining organizational competitiveness, knowledge management suggests a method in managing and applying knowledge for improving organizational performance. Much knowledge management research has focused on identifying, storing, and disseminating process related knowledge in an organized manner. Applying knowledge to decision making has a significant impact on organizational performance than solely processing transactions for knowledge management. In this research, we suggest a method of knowledge-based decision-making using system dynamics, with an emphasis to strategic problems. The proposed method transforms individual mental models into explicit knowledge by translating partial and implicit knowledge into an integrated knowledge model. The scenario-based test of the organized knowledge model enables decision-makers to understand the structure of the target problem and identify its basic cause, which facilitates effective decision-making. This method facilitates the linkage between knowledge management initiatives and achieving strategic goals and objectives of an organization.

Keywords: Knowledge Management, Naturalistic Decision Making, System Dynamics.

1. Introduction

Faced with uncertain and unpredictable business environments, organizations have paid attention to developing knowledge management systems that can provide the basis for future sustainability and competence (Malhotra, 2001). Knowledge management (KM) can be defined as uncovering and managing various levels of knowledge from individuals, teams, and organizations in order to improve performance (Nonaka, 1994; Davenport, 1998). The majority of previous methods in KM have been focused on frameworks for embodying KM effectively and comprehensively (Wiig, 1997; Gold, et al.,2001; Liebowitz et al., 2001), with an emphasis on the relation to business processes and performance (Grant, 1996; Davenport, 1998; Kim et al, 2003), and on gaining competitive advantage (Nonaka, 1994; Teece, 1998a,b). Where knowledge elicitation is the main concern (Ford and Sterman, 1998), decisions in organizational systems generally rely not necessarily solely on the individual, but also on experts working in the specific field. Because of their nature, decisions made within the organization are supported by a larger knowledge base, with more experience and from varying views (Skraba et al, 2003). A real challenge is to capture, control, and develop working knowledge or interpretation and integration of both the internal and external environments of the firm (Bennett, 1998). Organizations need to be smart, agile, and responsive to fast-changing environments. They need to respond and make smart decisions at ever-increasing speed, even as the unintended consequences of speedy decisions flare up in a nanosecond and keep leaders focused only on fire-fighting (Wheatley, 2001).

Grant (1996) identifies three primary mechanisms for the integration of knowledge to create organization capability: directives, organizational routines, and self-contained task teams. In situations in which task uncertainty and complexity prevent the specification of directives and organizational routines, teams of individuals with prerequisite knowledge and specialty are formed for problem solving (Alavi and Leidner, 2001). Effective KM, based on knowledge, should be able to support the core tasks of business management, namely that of decision-making and strategic planning. The problems of decision making in complex dynamic environments have also been examined by others, for example by Sterman (1989, 1994), whose key finding was that human performance in complex systems is poor relative to normative standards.

The focus of our research is to develop a method of knowledge-based decision making (KBDM) for application to business management problems. Business management problems are characterized by dynamic complexity, tacit knowledge factors, feedback effects over time, and unstructuredness (Sterman, 2001). The KBDM method commences with defining management problems that inherent to functional areas. Its application enables us to structure the target problem by integrating partial knowledge across functional areas. The structured problem, which is conceptualized within the integrated knowledge model, is then transformed into a simulation model. The simulation approach based on the model facilitates business decision support.

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2. Literature review on Knowledge based Decision Making

The study of decision making has evolved in the area of classical decision making (Savage, 1954), behavioural decision research (Edwards, 1961; Kahneman, et al., 1982), judgment and decision making (Meehl, 1954), organizational decision making (March and Simon, 1958; March and Shapira, 1982, 1987), and, more recently, naturalist decision making (NDM) (Klein et al., 1993; Zsambok, 1997). We can find that these researchers' decision environments have shifted from static and laboratory decision environments to dynamic and commercial business world ones. Additionally, the application of methods will be different depending on the decision-making context: whether it is strategic or operational. From the perspective of decision environments and decision-making targets, we have developed a matrix for applying various methods in differing decision environments, as shown Figure 1.

In static and laboratory decision environments, principally the stage model (Lipshitz and Bar-Ilan, 1996), AI approach (Newell and Simon, 1972; Mockler, 1989; Mockler and Dologite, 1992), decision tree, and cognitive mapping (Axelrod, 1976) are used for conventional decision-making. Knowledge-based expert systems (ES) in a replacement role prove to be effective for operational and tactical decisions, but have limitations at the strategic level (Edwards et al., 2000). ES in a support role, as advisory systems, can help to make better decisions, but their effectiveness can only be fulfilled through their users. The AI approach is focused on well-defined problems, but its limitation is a closed problem space generated from a finite set of objects, relations, and properties. Although knowledge-based expert systems have been developed for strategic planning, most ES have not modeled the structure of strategic problems. They have just defined the structure of expert knowledge by integrating with conventional computer systems - especially database and spreadsheet-based system, and financial analyses, modeling, forecasting and reporting system.

In cognitive modelling, the cognitive map has been a widely used technique. This method has varying nomenclature: cognitive map (Tolman, 1948; Axelrod, 1976; Klein and Cooper, 1982); cause map (Hall, 1984; Eden at el., 1992); influence diagram (Diffenbach, 1982; Ramaprasad and Poon, 1985); and, knowledge map (Howard, 1989). The cognitive map represents relationships that are perceived to exist among attributes and/or concepts of a given environment. While this model does not consider the time factor, causal concepts may affect each other over time. Therefore, cognitive mapping has a limitation in explaining the dynamic features of the lived world.

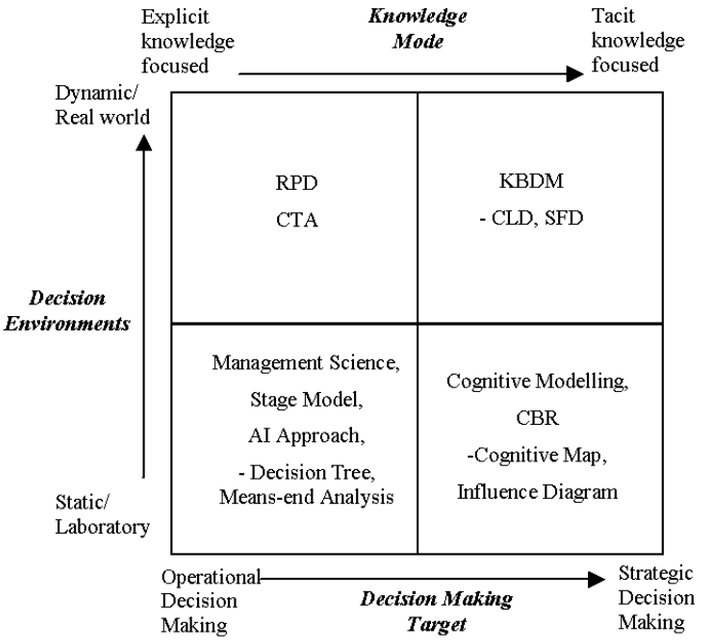

Figure 1. Applying method in decision environments

Within the context of NDM, for dynamic and lived commercial world decision environments, the most common methods are cognitive task analysis (CTA) (Klein et al., 1989; Gordon and Gill, 1997), recognition-primed decision (RPD) model (Janis and Mann, 1977; Klein, 1993), and situation awareness (SA) (Klein, 1999). NDM researchers seek to understand 'cognition in the wild' (Hutchins, 1995) but, arguably, usually focus on the expertise and operational level, not on the strategic decision-making. Expertise is not easily defined in many organizational settings because the outcome of most decisions has multiple causes and effects, most of which any given decision maker is not likely to know or understand. NDM cannot identify the cause-effect relationships and feedback of knowledge and influences of time. The challenges of NDM are to develop simulation methods and to enhance methods of knowledge elicitation (Hoffman et al., 1998) of decision-making in naturalistic settings.

In terms of characteristics of top management decision-making, the decision environments are dynamic and *real world*, and they mainly manage strategic decision-making, and are tacit knowledge focused (Bennett, 1998; Edwards et al., 2000). And, in order to make decisions in the real world, top managers have to manage and use knowledge that is related to strategic problems. Therefore, we suggest a KBDM method for these situations that will support decision-making or strategic planning by top management levels using the system dynamics (SD) as stated in the following section.

3. System Dynamics Approach for Knowledge based Decision Making

3.1 Assumptions of the method

The knowledge-based decision making (KBDM) method enables managers to make decisions under dynamic non-trivial environments with system dynamics. To address the issues identified in the previous section, our method is based on the following underpinning assumptions.

- *Decision-making and knowledge are closely linked.* (Hall et al. 2001, Liebowitz and Beckman 1998)
- *Top management make decisions approximating NDM.* (Bass 1983, Sternberg 1997; Edwards et al., 2000)
- *Focus on application of knowledge in decision making, rather than decision making method.* (Alavi and Leidner, 2001; Courtney, 2001; Hall et al., 2001; Ozbayrak and Bell, 2003)
- *Adopt SD techniques and concepts in order to apply in dynamic and real-world environments. (Kim and Senge 1994,* Senge, 1990, Sterman, 1991, 2001).

3.2 Method of Knowledge-based Decision Making

KBDM consist of 5 phases, which are: 1) Define problems, 2) Conceptualization of Knowledge, 3) Formulation of Knowledge Model, 4) Testing and decision making support, 5) Applying. We summarized the phase of KBDM in each phase in Table 1 respectively.

Phase	Tasks/activities	Output	Technique
1	Define strategic issues & Identify sources of knowledge	Strategic issues, scope and knowledge	Interview, Brainstorming, Document analysis
2	Conceptualization and Integration of Knowledge	CLD, Problem statements	Focused group interview
3	Formulation of Knowledge Model	SFD, Decision requirements	Focused group interview, Feedback analysis
4	Decision making support	Simulation test	Simulation test, Focused group interview,
5	Applying	Feedback	

Table 1. Five Phase of KBDM Application

4. Comparison of system dynamics with other methods

As a research method, the SD approach can be compared to Management Science. However, the research on SD starts with a different assumption from the traditional assumptions of Management Science. 1) Developing models based on numerical figures, 2) Analyzing most problems by linear relationship, 3) Reflecting a limited number of variables which are influenced by results in a static condition, 4) Accuracy of model parameters is more important than the overall problem structure, and 5) Pursuing optimal support decision making. (Richardson, 1983)

With respect to the first assumption of numerical data, the number of this type of data is extremely limited in comparison to that of all recognizable variables in real systems. Furthermore, providing that real systems are modelled by data expressed with numerical data, this certainly leads to restriction on applicability. Soft variables like customer satisfaction or marketing promotion act to take a very important role in the process of real world decision-making. In the analysis of linear relationships, complexity - such as complex feedbacks - caused by interactions among elements in the system cannot be modelled with linear relationships. In case of the third assumption on the static nature of data, various feedbacks dynamically influence the overall system through the flow of time. Consequently, relationships of dynamic feedback and all relevant variables should be recognized. (Manzoni and Angehrn, 1998) The accuracy of parameters, optimal value obtained from the system - where feedback is not reflected but, still containing accurate parameter values -- cannot be regarded as a correct value since not all feedbacks are included in calculating the optimum value. Lastly, the assumptions on the pursuit of optimum, the complexity of the system, accessibility of necessary data and accuracy of data are those that determine feasibility of obtaining optimum.

5. Conclusion

As a new asset in reinforcing organizational competitiveness, knowledge management has often been suggested, and its management and application has been widely studied. Despite the fact that it has such a wide acceptance, most KM research has aimed to identify, store, and diffuse knowledge for the accomplishment of tasks more effectively. In comparison, we propose the application of KBDM for knowledge based business decision-making and strategic planning which is at the core of business management. This method facilitates the linkage between KM initiatives and achieving strategic goals and objectives of an organization. Furthermore, this research makes an important contribution by providing a starting point of future research through the combination of knowledge management and system dynamics.

A limitation in the proposed approach is that it is not easy to validate the organized knowledge model

because its structure is based on cognitive models. For validating the relationships among the partial knowledge factors, problem-related personnel should join together in verifying the model. Yet another limitation would be a lack of relevant data for testing. In most business situations, information without any specific purpose is rarely kept. Consequently, additional data collection efforts - reviewing and analyzing the existing data and conducting interviews - should be completed. Upon collecting all the required data for testing, there are several ways to validate the formulated knowledge model, such as sensitivity testing and matching between the test results and historical data. The most important aspect in validation, however, is to check the accuracy of the structure of the knowledge model. To overcome these limitations, a more effective validating method should be developed and applied.

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