Finite-Base Revision Supporting Knowledge Management and Decision Making

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INTRODUCTION

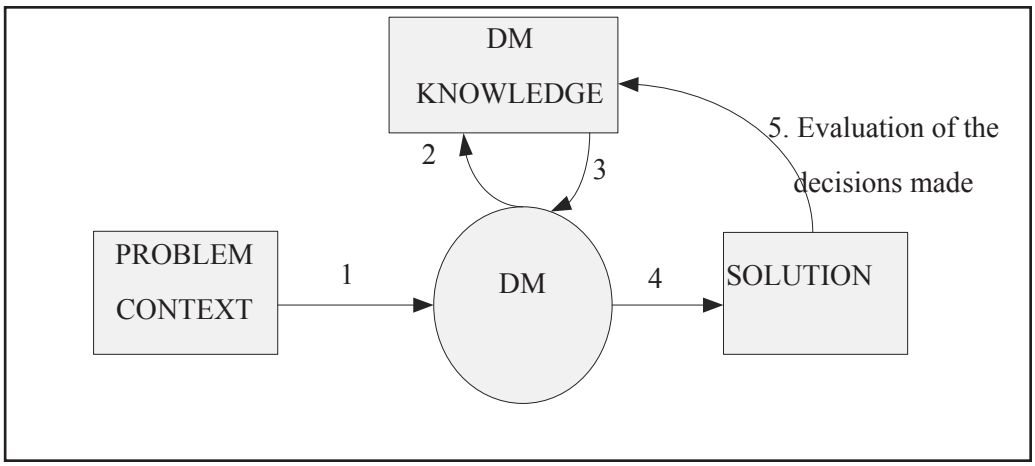
Generation and most of all sustainability of organizational success rely heavily on proper decision making and on the application of knowledge management (KM) concepts, where knowledge-based structures are fundamental components. KM can also be viewed as a means to support enhanced decision making through effective control of organizational knowledge. One of the main goals of KM is to capture, codify, organize, and store relevant knowledge into repositories, knowledge bases (KB), for later retrieval and use by organizations. However, there is always the danger of accumulating knowledge in an increasingly vast way, such that it becomes impossible to process it when necessary. Therefore, appropriate technologies have to be identified to protect us from irrelevant information. As the study in Handzic (2004) shows, decision-makers need to pursue primarily one KM strategy in order to use knowledge effectively. Moreover, the codification KM strategy using procedural knowledge maps was proven to be quite appropriate for solving decision problems of a complex nature. It is commonly agreed that KM can bridge the existing information and communication gaps within organizations, consequently improving decision making (Dargam & Rollett, 2007).

Interactions among the decision-makers may happen in many different ways. They may agree towards a common goal, or may have different arguments and points of view, which lead the process to contradictory objectives. They may know each other and work together, or they may work in different places and even in different times. Their influence on the decision-making process may also vary, according to their individual levels of responsibilities at work. Decision-making as well as KM require both information and knowledge. Information can be made explicit, while knowledge resides within its possessor and can only be made explicit via its articulation, that is, via the generation of "explicit knowledge." Following the studies of Carlsson and Kalling (2006), knowledge sharing is considered a fundamental aspect coming from KM to decision making (DM). Carlsson and Kalling (2006) say that knowledge sharing through the use of knowledge management systems (KMS) should be viewed as a means and not as an end, since it does not always lead to organizational overall improvement. Organizations face four particular representations of information or knowledge-based indeterminacy (Zack, 2004), namely: uncertainty, complexity, ambiguity, and equivocality, which are often present in many knowledge-based structured business applications. Compromise Finite-Base Revision can be applied as a specific KB revision approach. The "equivocality" problem is tackled, where multiple interpretations of information may occur, as well as contradictions and diversity of viewpoints, when updating a KB. Whenever an "equivocality" problem occurs, revision of finite-bases can be seen as a useful knowledge management approach for keeping consistency in the base, or for handling inconsistencies in a context-dependent way. We support the view of understanding the origin of the knowledge problem in hand in order to be able to apply the appropriate solutions, among the available ones.

BACKGROUND

As we rapidly move into a global knowledge society, proficiency in KM is increasingly important to the competitiveness of decision makers. When a decision is made, the decision-maker has to use his knowledge concerning the situation involved in order to deliver a solution by taking a decision. This aspect was also noticed and illustrated by Debilasic and Suknovic (2006). In Figure 1, the process of decision making is illustrated, explicating the use of knowledge for solving a problem.

Figure 1. Interaction of decision-making and knowledge (Debilasic & Suknovic, 2006)



Knowledge is needed in almost all levels of decision-making, and therefore also for making business decisions. In KM, one of the main concerns is to use the available knowledge for supporting and evaluating the business decision process for efficiently improving decision-making.

As pointed out in Dargam (1996a, 1996b, 1999), inconsistency should be faced and formalized. Revision techniques should be applied, viewing inconsistency in a context-dependent way as a signal for external or internal actions. Dealing with inconsistencies is not necessarily a job for restoring consistency, but rather for supplying rules, which state how to act in the case of inconsistencies. In the AGM theory, Alchourrón and Makinson (1982, 1985), Alchourrón, Gärdenfors, and Makinson (1985), and Gärdenfors (1988) introduce their revising strategy by means of a set of postulates, which can be viewed as dynamic integrity constraints or transitions laws. Those postulates reflect the possible operations on belief sets, including three main types of belief change, namely:Expansion, Contraction, and Revision. In Belief Revision, the main concern is to solve the problem of revising derived beliefs whenever there is a change on the underlying set of beliefs. The approaches in this area adopt particular revising policies as strategies, which varies from temporal priority of facts to ordering definitions on the base, for instance, in order to restore consistency whenever the underlying set of base beliefs is modified. The revision operation reflects the following concept (Gärdenfors, 1988), that when we change our beliefs, we want to retain as much as possible of our old beliefs. Information is not in general gratuitous, and unnecessary losses of information are therefore to be avoided. Here we also follow this *informational economy* notion, by adopting a revision approach that allows more information to be kept in a base. A logical framework for reasoning about updates in the presence of contradictory data is used, where inconsistency is eliminated by managing safe-maximal sets within a reconciling strategy. Such strategy allows for consistent consequences of conflicting inputs to be kept in the resulting base.

FINITE-BASE REVISION AS A KM APPROACH

Compromise Reasoning

In Dargam (1999), the compromise reasoning model was presented as a revision mechanism for updates in KB. Basically, it proposes a method for reconciling logically conflicting inputs into knowledge bases, by imposing some restrictions on their consequences, among the many possible ways to invoke compromises in a disputing case. Hence, when a revision applies, as many as possible of the consistent consequences of the retracted sentences are kept in the base as a compromise. Compromise reasoning has been applied to decision making and negotiations in Dargam (1998, 2005), where decision support, negotiation, and argumentation systems were illustrated as suitable application areas. In cooperative as well as in negotiation decision support systems (DSS), the compromises considered by