

A Hierarchical Model for Knowledge Management

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INTRODUCTION

Knowledge management (KM) is a multidisciplinary subject, with contributions from such disciplines as information systems (IS) and information technology (IT), strategic management, organizational theory, human-resource management, education science, psychology, cognitive science, and artificial intelligence. In order to take full advantage of these various contributions, the necessity of a multidisciplinary approach to KM is currently widely acknowledged, particularly in the IS and IT, management, and artificial-intelligence communities (Alavi & Leidner, 2001; Dieng-Kuntz et al., 2001; Grover & Davenport, 2001; Nonaka & Konno, 1998; O'Leary & Studer, 2001; Zacklad & Grundstein, 2001).

Several KM models have been proposed in the literature. These models reflect the diversity of disciplines contributing to KM. By describing KM concepts and investigating their relationships, they provide a useful conceptual tool for KM research and practice. However, they suffer from three major limitations.

- They are often incomplete. This may be intentional (in the case of models focusing on a specific aspect of KM) or reflect disproportionate emphasis on one of the disciplines contributing to KM, for example, IS and IT.
- They are inappropriate for navigating between abstraction levels of KM topics (“drill down” or “drill up”).
- They do not provide a structure for the quantitative assessment of KM research and/or practice (e.g., for auditing KM practice in a specific company).

This article presents a KM model that aims at providing a solution to these three problems. The model is formalized and structured as a hierarchy, which enables navigation between the abstraction levels of KM topics. Furthermore, by combining this hierarchical structure with the analytic hierarchy process (Saaty, 1980), the KM model may be applied to quantitatively assess KM practice and/or research. The model is organized into three components: knowledge types, KM processes, and *KM context*. It integrates the contribution of previous models and reflects the multidisciplinary aspect of KM.

The article is structured as follows. The next section provides an overview of extant KM models, that is, the background of our work. Then the article presents our hierarchical KM model, develops its three components, and discusses and illustrates how the model may be applied to KM research and practice. Before concluding, we present our view of future trends and research opportunities regarding KM models.

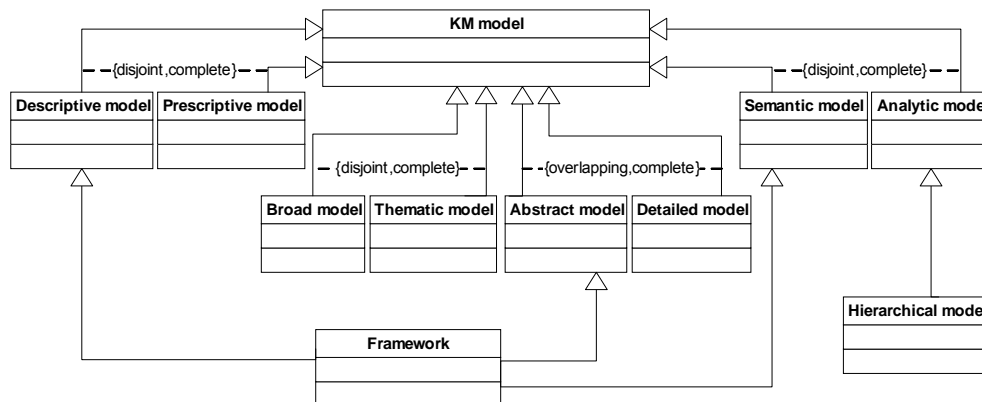
KM MODELS

ISO (2004) defines a model as a “limited representation of something suitable for some purpose.” This definition applies to KM models. In broad terms, the purpose of these models is to provide conceptual tools for KM research and/or practice.

Figure 1 proposes a classification of KM models. This classification elaborates on and refines the classification criteria proposed by Holsapple and Joshi (1999) for KM *frameworks*. Figure 1 uses the UML (unified modeling language) formalism (OMG, 2003) for representing classes, generalizations, and generalization constraints. We classify KM models according to four complementary criteria (the first two criteria are those defined in Holsapple and Joshi).

- A KM model is either *descriptive* (i.e., describing the nature of KM phenomena) or *prescriptive* (i.e., proposing methodologies for performing KM).
- KM models are either *broad* or *thematic*. Broad models attempt to cover the whole of KM, while thematic models focus on a specific topic.
- A KM model may be *abstract*, *detailed*, or both (as indicated by the generalization constraint in Figure 1). This classification complements the distinction between broad and thematic models. For example, a broad model may be both abstract (providing a global view of KM concepts or topics) and detailed (enabling navigation into the details of a topic).
- The last classification distinguishes between *semantic* and *analytic* models. Semantic models describe the meaning of KM concepts and their interrelationships. Analytic models adopt a deductive

Figure 1. A classification of KM models



approach, progressively detailing KM topics by decomposing them into subtopics.

In addition to these four classifications, Figure 1 represents two specific types of KM models: frameworks (defined as KM models that are at the same time descriptive, abstract, and semantic) and *hierarchical models* (a special kind of analytic model).

Several KM models have been proposed in the literature (Alavi & Leidner, 2001; Davenport & Prusak, 2000; Despres & Chauvel, 2000; Fowler, 2000; Grover & Davenport, 2001; Handzic, 2001; Holsapple & Joshi, 2004; Newman & Conrad, 2000; Nissen, 2002; Nonaka, 1994). A comparative analysis is presented later in this article. If we consider the above-presented classifications, we notice that existing KM models are often descriptive, abstract, and semantic models, that is, frameworks. All the models are semantic. Consequently, elaborating on the contribution of these models, our objective is to define an integrated, analytic KM model. This broad, analytic model will facilitate navigation into the details of KM topics and enable the quantitative assessment of KM research and/or practice.

A HIERARCHICAL KM MODEL

In this section, we present our KM model and compare it with previous models; we discuss and illustrate how it may be applied to KM research and practice.

Introduction

KM comprises a set of processes. These processes concern knowledge (e.g., knowledge transfer) and are influenced by context (e.g., the organizational culture). Consequently, KM models are often structured around the

concepts of KM processes, knowledge, and/or context (Alavi & Leidner, 2001; Despres & Chauvel, 2000; Grover & Davenport, 2001; Handzic, 2001; Holsapple & Joshi, 2004). These concepts form the three basic components of our model.

- The *knowledge types* component characterizes knowledge according to several complementary classifications.
- The *KM processes* component is dedicated to KM activities.
- Finally, the KM context component comprises the factors that influence (positively or negatively) the conduct of KM. Depending on their nature, these factors may (more or less easily) be controlled to improve KM.

The components of our KM model are organized into a hierarchy. The concepts of the model are represented as nodes. The parent-child relationships between nodes are abstraction relationships: A parent node is detailed by its children nodes (or conversely, a child is abstracted into its parent). There are no generally applicable structural criteria indicating when decomposition should stop. This is guided by semantic and practical considerations (e.g., the decomposition of a concept stops when the concept is easy enough to measure in practice or when further decomposition would be meaningless).

We describe the three components of the KM model.

Knowledge Types

The part of the KM model pertaining to knowledge types is represented in Figure 2. Elaborating on previous work, we propose four complementary classifications for characterizing knowledge.

The first classification, which is almost universally adopted in previous KM models, distinguishes between

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