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A conceptual model and technological support for organizational knowledge management

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HIGHLIGHTS

- A KM background and a discussion of failure factors associated to KM are presented.
- A set of requirements that any KM model or initiative should met is defined.
- A comprehensive KM model based on the defined requirements is depicted.
- An architecture for distributed organizational memory is developed.
- Semantic treatment of knowledge sources by information retrieval strategies is proposed.

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ABSTRACT

Knowledge Management (KM) models proposed in the literature do not take into account all necessary aspects for effective knowledge management. First, to address this issue, this paper presents a set of requirements that any KM model or initiative should take into account to cover all aspects implied in knowing processes. These requirements were identified through a critical and evolutionary analysis of KM. Second; the paper presents a new distributed KM Conceptual Model whose building blocks are the knowledge activities involved in knowing processes. These activities are: knowledge creation, knowledge sharing, and knowledge representation and retrieval. This model provides a holistic view of KM whose purpose is helping managers understand the scope of this initiative, and supplying a guide for research and implementation in organizations. In this sense, the model presents KM as a highly social rather than technological process. Third; the paper briefly describes an architecture to provide a technological support for knowledge representation and retrieval activities of the proposed KM Conceptual Model. This architecture allows implementing a distributed organizational memory that helps to represent the knowledge context through an ontological model, providing a local perspective of each knowledge domain within the organization. Strategies for knowledge annotation, knowledge retrieval, and ontology evolution are briefly described and results of preliminary performance analysis are shown. Finally; based on the available literature, a comparative analysis of different KM models shows their adequacy for previously presented requirements.

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1. Introduction

Rapid changes in today's environment lead organizations to adjust and update the knowledge they have to maintain their competitive advantage [54]. Past research, however, has shown that this is not a simple task since most issues related to KM are multifaceted and require a holistic approach [37].

In this context, the concept of Knowledge Management System (KMS) emerged with the aim of supporting organizations in knowledge creation, distribution, and management [19]. A KMS can be defined as the practice of using prior knowledge to make decisions that affect current and future effectiveness of the organization [28]. There is plenty of literature in this field related to studies that focus on KMS rating and success evaluations of KMS implementations in organizations [4,35].

The emergence and use of different KMS have led many researchers to be interested in examining whether KMSs really work and finding out factors of their success. Ackerman [1] concluded that 80% of analyzed KMS initiatives failed due to overoptimistic expectations on their capabilities.

Jennex and Olfman [29] explored the use of KMS legacy by new employees in a number of U.S. companies and found that they would rather not use these systems just because they had poor understanding of their functioning. These authors suggested providing detailed guidance on the use of the system rather than theoretical descriptions of the system. In another study, Jennex et al. [30] examined the negative effect of the lack of a strategy associated with KMS in growing organizations.

Failed KMS initiatives have encouraged research into critical success factors for KMS implementations. Research findings by Alavi and Leidner [3], Barna [8], Davenport et al. [19], Chournazidis [16], and Yu et al. [80] suggest that a knowledge-friendly organizational culture is a key driver of successful KMS implementations. Wong and Aspinwall [78] identified and analyzed eleven critical success factors when adopting KM. Their studies indicate that culture and support for management leadership are main issues for successful KM implementation. On the other hand, findings by Chan and Chau [14] imply that leadership and commitment of top management are two of the most important factors. Studies by Barna [8], Dixon [20], Wenger et al. [75], and Yu et al. [80] support the existence of the KM strategy as a key success factor, while Sage and Rousse [56], Cross and Baird [18], and Chan and Chau [14] defend the importance of having the right technological infrastructure for successful KM implementation.

The analysis of the aforementioned literature leads to the conclusion that KM initiatives implemented in organizations often fail to manage the natural heterogeneity of organizational knowledge sources. Knowledge is usually regarded as something that can be managed as a physical asset. Their success was also affected by several reasons related to tacit knowledge capture and tacit-to-explicit knowledge conversion. Therefore, an approach with a new conceptual basis is necessary to emphasize semantics of organizational knowledge objects. Organizations need a more comprehensive conceptual model for KM and specific tools and policies to implement activities involved in KM. New issues arise to include knowledge storage and retrieval, and repositories creation and management.

In order to address these issues, this paper presents the following contributions: a set of requirements that any KM model or initiative should take into account to cover all aspects implied in a knowing process; a critical and evolutionary analysis of KM through which these requirements were identified; a new KM model that satisfies these requirements; a technological architecture for a distributed organizational memory designed by taking this KM model as a basis; a knowledge object annotation strategy and an information retrieval strategy developed for this architecture; an information system implemented to support this architecture; and a comparative analysis of different KM models to show their adequacy for the identified requirements.

The technological architecture is aimed at addressing two implementation problems related to KM: a) documentation overload, related to knowledge elicitation to feed knowledge repositories; and b) lack of context associated to tacit-to-explicit knowledge conversion. The annotation and information retrieval strategies were designed to enable the use of unstructured and semi-structured knowledge sources and natural language queries. The information system implemented to support this architecture was developed to allow an automatic semantic treatment of heterogeneous organizational knowledge sources and to facilitate knowledge sharing between domains by means of an interface that allows exchanging information through the propagation of natural language queries.

This paper is organized as follows: Section 2 provides a KM background followed by a discussion of most usual criticism and failure factors associated to KM. Section 3 proposes a set of requirements derived from the previous analysis. A comprehensive KM framework based on the defined requirements is depicted in Section 4. Section 5 presents the architecture of the distributed organizational memory, which is responsible for annotating and retrieving knowledge objects written in natural language. Section 6 presents an information system that implements this architecture; and its performance is evaluated in a case study related to a tourism company as a study case. A comparative analysis of current KM models is provided in Section 7. Finally, conclusions and future work are discussed in Section 8.

2. KM criticism and failure factors

According to Grant and Grant [24], the work done by many recognized experts in the field – both academics and practitioners – clearly show that the field of KM has significantly evolved over a very short period of time and it has been the focus of management attention. During this period, while there has been much debate about the nature of knowledge and the role of KM, there has been relatively less critical analysis of the foundational concepts underlying KM practices. Most