Information Systems 62 (2016) 1–28

Contents lists available at ScienceDirect

Information Systems

journal homepage: www.elsevier.com/locate/infosys

Process-aware approach for managing organisational knowledge

Carlos M. Toledo*, Omar Chiotti, María R. Galli

INGAR(CONICET-UTN), Instituto de Desarrollo y Diseño, Consejo Nacional de Investigaciones Científicas y Técnicas, Avellaneda 3657, S3002GJC Santa Fe, Argentina

ARTICLE INFO

Article history:
Received 24 February 2016
Received in revised form
1 April 2016
Accepted 3 April 2016
Recommended by: D. Shasha
Available online 25 April 2016

Keywords:
Knowledge management
Tacit knowledge
Explicit knowledge
Business process
Groupware

ABSTRACT

Knowledge is currently considered an asset for organisations. In this new paradigm, Knowledge Management (KM) is emerging as an unavoidable activity for organisations. Information and communications technologies, together with business policies, become a tool par excellence for supporting the creation of KM platforms that provide access to organisation knowledge resources such as workers, technical reports, software applications, and business documents. In spite of the benefits provided by current KM platforms, most of them were designed to manage a single type of knowledge (tacit or explicit) without considering either the form in which organisational areas need knowledge to be provided (reactive or proactive) or the integration with business processes. This work presents a process-aware approach to develop KM platforms linked to business processes with semantic capability to manage knowledge objects with natural language content as well as to support social interactions and ad hoc working groups. To this aim, a comprehensive analysis of influencing-KM factors to be addressed by technological solutions is considered by a set of technological requirements. Based on these requirements, a model that provides the main components to be addressed by KM approaches is specified and implemented by a technological platform. This platform goes after a balance between technological and social aspects that support and promote collaboration and communication among organisation members.

1. Introduction

Organisation-related knowledge is classified as *tacit* and *explicit* [1]. For managing both knowledge types, organisations must promote shared environments, called *ba*, which enable members to access organisational knowledge [2,3]. *Externalisation*, *socialisation*, *combination*, and *internalisation* were identified as conversion processes carried out into *ba* environments that enable knowledge creation and transformation [4].

Information and communication technologies (ICTs) enable the creation of KM platforms that act as virtual *ba* environments [5], allowing members to interact with one another and with available knowledge resources [6–9]. KM platforms represent an important advance that strengthens the implementation of KM approaches [10].

Most of KM approaches were developed to manage a single knowledge type (tacit or explicit) without considering either the form in which organisational areas need knowledge to be provided (reactive or proactive) or the integration of their members' daily work [11]. Frequently, current KM research also has a partial view according to which knowledge is considered as an objects codified independent of organisation members or,

* Corresponding author. Tel.: +54 342 453 4451; fax: +54 342 455 3439.
E-mail addresses: cmtoledo@santafe-conicet.gov.ar, cmtoledo@gmail.com (C.M. Toledo).

http://dx.doi.org/10.1016/j.is.2016.04.001
0306-4379/

conversely, as tacit knowledge exclusively dependent on organisation members [12] without compromising both points of view [13].

KM should be addressed from a holistic perspective able to support all conversion processes through a single technological solution, providing knowledge in a reactive and proactive way, as well as promoting social interactions among members to share tacit knowledge [14]. This perspective requires thinking of ICTs as a means to manage explicit knowledge codified in knowledge objects (such as documents with natural language content, memorandums, and emails) and to allow communicating and facilitating cooperation among organisation members as well. Cooperation and communication activities and tools for managing ad hoc work groups facilitate the creation of internal social networks, which help in generating new knowledge [15]. These tools could be also exploited for tacit knowledge preservation by an externalisation process that stores such interactions in the organisational knowledge repository, turning them accessible to all organisational members.

In addition to tacit and explicit KM, a platform should consider that organisations frequently orchestrate their activities in structured business processes composed of tasks that require and/or produce knowledge [16]. Current KM platforms are not usually linked with organisational business processes [17]. The integration enables them to benefit from the business process structure to collect context information and thus anticipate the need of knowledge organisation members for carrying out business process tasks [18].

This work presents an approach to develop KM platforms linked to business processes with semantic capability to manage knowledge objects as well as to support social interactions and ad hoc working groups. By analysing high-level concepts presented in a Reference Conceptual Model for KM [19], a set of requirements to be taken into account for the implementation of KM platforms is identified. Based on these requirements, a novel model for distributed KM (MfDKM) that provides the main components to be addressed by KM platforms implemented as virtual *ba* environments is specified. Finally, a KM platform that implements the proposed MfDKM model is presented. The platform uses tools, mechanisms, and semantic strategies to fulfil identified requirements. It is worth highlighting that the implemented platform is not just an integration of technologies but a novel solution based on the proposed MfDKM that provides a framework for its implementation.

The remainder of this paper is structured as follows: Section 2 introduces a set of requirements for implementing organisational KM platforms. Section 3 presents an analysis of current KM approaches. Section 4 depicts a model for distributed KM. Section 5 discusses strategies for explicit and tacit KM. Section 6 presents a technological architecture for implementing MfDKM in a KM platform. Section 7 outlines a case study in a tourism enterprise and a performance analysis of semantic strategies for managing explicit knowledge. Finally, conclusions and future work are drawn in Section 8.

2. Requirements for implementing organisational KM platforms

An analysis of prominent works related to organisational KM allowed identifying the following key factors to be considered for implementing KM approaches: support for knowledge life cycle, ICTs, and semantic technologies, business processes as facilitators for providing knowledge, knowledge provision depending on users' skills, support for communication among members as a means of knowledge generation, support for creating communities of practice and working groups, knowledge domains and knowledge context representation [9,20,12,13,19]. Managerial factors such as organisational politics and culture [6,21–25], leadership commitment [26,27], and organisational KM strategies [23,28] should be also considered.

Based on these factors, a set of functional and non-functional requirements is defined. These requirements are described below:

R1. Reactive knowledge supply by semantic searches: Semantic technologies facilitate the representation and search of knowledge stored in unstructured formats [29–35]. Ontology, lexical databases and artifacts for processing natural languages improve the completeness and accuracy of knowledge search results [36,37].

R2. Anticipative knowledge supply: Organisation members should proactively obtain the required knowledge to perform business process tasks, thus reducing the time spent in knowledge search [38,39].

R3. Integration with structured business process: A Workflow Management System (WfMS) can be used to develop an infrastructure for distributing the knowledge required by members to perform business process tasks [5]; and context information of structured business processes should be exploited for this purpose [40–43]. A WfMS should be considered as a trigger of activities that support KM such as capture, distribution, and storage [39].

R4. Ability for managing working groups and semi-structured business processes: Communities of practice and working groups enhance collaborative work in the organisation [44,45]. They encourage interactions among organisation members through shared work spaces [46,47]. Groupwares are suitable tools to support working groups and communities of practice by promoting knowledge socialisation processes (i.e. tacit-tacit conversion) [15,48–50].

R5. Local view of knowledge repositories: Each domain (organisational area) must manage its own knowledge by selecting appropriate perspectives for storing, retrieving security and privacy politics applied to local knowledge (Autonomy principle) and must be able to share knowledge with one another (Coordination principle). Both principles enhance distributed features of KM platforms and promote a consistent administration of knowledge by each domain while organisational knowledge is shared [51].

R6. Distribution of knowledge repositories: Knowledge is voluminous, context-sensitive, and can be stored in several applications and in different organisational