Managing Information and Knowledge
A Proposal Methodology for Building an Integrated Model based on Information Assets Identification

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Abstract: This paper aims to present and discuss a methodology for building an integrated model for information and knowledge management, based on the identification of strategic information assets (IA). It begins with the collection of best practices and benchmarks and the analysis of internal documentation, including the organization mission and vision statements, to then identify strategic information assets that give business support. During field visits and structured interviews for collecting information, information assets are analyzed and partial formal models are then produced. Those models are gradually consolidated into an integrated model. The adopted modelling techniques include: definition of business requirements; development of business use cases and an information model; the representation of information flows; and the identification of knowledge, skills and professionals. The ontology model is used to clarify concepts definitions in this domain. The methodology includes current situation analysis (as is), identification of gaps and the proposal of improvements, which are all reflected in the desired situation models (to be). Project innovation lies, mainly, in the use of IAs and the combination of complex elements to build a unique model that integrates information management and knowledge management components in the same framework.

1 INTRODUCTION

This paper aims to discuss a methodology for building an integrated model of information management (IM) and knowledge management (KM), based on the identification of strategic information assets and present its main components.

The model is being developed under the technical cooperation project between the regulatory authority for Brazilian overland transport sectors (ANTT) and Fluminense Federal University (UFF), through its Laboratory of Information and Communication Technology Management (GTECCOM). This ongoing project, initiated on December 2010 and is scheduled to end on April 2014, and aims to identify relevant business information assets and propose an integrated model for IM and KM, which is able to provide elements for manage strategic information and organizational knowledge in a more efficient and effective way.

The content of the paper is organized as follows: first, in Section 2 we present a review on information assets (IA), information management (IM) and knowledge management (KM), considering that information and knowledge concepts are complementary and mutually supportive and that, therefore, an organization strongly dependent on information, such as the regulatory agencies, benefit from an integrated model based on the identification of information assets to consolidate IM and KM in an enterprise architecture. Later, in Section 3 we discuss more specifically the model characteristics, including the main concepts that support its construction, including contributions from different areas. In this same Section the proposed methodology for the

construction of the final integrated model is discussed, based on information assets. Next, in Section 4 we present a brief description of project status and its main expected benefits. Finally, our conclusions are presented in Section 5, including future research possibilities.

2 INFORMATION ASSETS, INFORMATION MANAGEMENT AND KNOWLEDGE MANAGEMENT

The information is vital for organizations and it is one of the most valuable organizational assets and raw material to provide and create new services. The information is used to support daily work, helping organizations to perform their duties and provide their services properly (Caralli, Allen, Curtis, White and Young, 2010). Being an important strategic asset as important as people, capital and technology, information, as other corporate assets, should be managed so that it can be used and be available when needed. (The National Archives, 2011; Government of Alberta, 2003).

Increasingly, organizations around the world are recognizing the value of their information assets (IA). IA are defined as an identifiable collection of data, stored in any manner, and recognized as having value or potential value for the purpose of an organization, enabling it to perform its business functions, thereby satisfying a recognised requirement (Higgins, Hebblethwaite and Chapman, 2006). IA, therefore, cover the resources that are or should be managed in order to be easily accessible as they represent potential future economic benefits. (Information Access Development, 2012; Caralli et al, 2010; Oppenheim, Stenson and Wilson, 2003; Davenport and Prusak, 1998).

IA are not always easy to identify, it can be complex and interrelated. To build the information culture, it is needed to ensure that the organization know and recognise its IA. (Higson and Waltho, 2009).

IM involves the planning and controlling of all IA needed to meet corporate goals and to deliver adequate services to society. It refers to the application of consistent practices related to planning, creation, capture or collection, organization, use, accessibility, dissemination, storage, protection and disposition of information. The focus is on the management of how we work with information content and how we optimize the

value of IAs (Government of Alberta, 2003).

Knowledge is also viewed as a capital asset of economic value, a new strategic resource in productivity enhancement (Van Berten and Ermine, 2006). KM is a systematic and explicit capture of the individual or collective experience of an organization to make it accessible to which this experience is useful. Good ideas, regardless of where they have been generated or located, can be captured and transferred adequately to those who have similar problems. KM involves maximizing the value of information and converts it into knowledge, leading to more robust decisions. KM allows knowledge to be located, formalized, shared, enriched and developed to stimulate innovation and creation through a better productivity of knowledge (Ermine, Boughzala and Tounkara, 2006). Good information management needs to be partnered with good knowledge management. If it isn´t, the value of information as an asset is undermined, and efficient service delivery is compromised (HM Government, 2008). KM involves a set of approaches to enable information and knowledge to grow, flow and create value in an organization. (Rao, 2005).

The establishment of an effective IM system, therefore, is essential to perform KM. Li and Song (2009) declare that knowledge and information have mutually reinforced each other, which makes them inseparable elements. The information-oriented IM and KM based on knowledge sharing & use have a close relationship. IM provides the basis of software and hardware for KM. IM and KM are complementary fields of study, as are, information and knowledge, and therefore can support each other and act as enablers of one another. For many authors, KM involves the effective use of information and IM is the key to support the creation of knowledge and its application on organizations, so that they act more intelligently. Good KM associated with good IM is a priority for organizations. And good IM is the foundation for the implementation of good KM (Li and Song, 2009; HM Government, 2008). Schiuma, Carlucci and Sole (2012) discuss that information and knowledge assets and their management represent essential drivers for organizational value creation.

3 METHODOLOGY FOR BUILDING AN INTEGRATED MODEL OF IM AND KM

To build an IM and KM model, it is important to

start with a research in order to have a good overview about the organization involved. Thus, a broad representation of the organization is built from information obtained in interviews with top management, and also information taken from readings of specific documentation related to the performance of organization, as relevant legislation, internal regiment, standards, as well as the organizational mission and vision statements. The purpose of this specification is to understand and document the organization's objectives, interfaces with the external environment, identifying its subsystems and their main services involved. At this stage of preparation, a management and references model is also prepared. It is a unique reference model, originated from the integration and compatibility of other references, including classical, specific and internal ones, which legitimize organization´s duties consistent with its culture, values and beliefs (Cardoso, Spiegel, Caulliraux and Proença, 2008). This management model enables the organization to identify other possible practices to be adopted and also other IA that can be incorporated into IM and KM model.

Based on the identification of IAs, surveys are implemented in order to build models, making use of an iterative approach. Each iteration has a set of well-defined objectives and produces a partial model of the final one, using as input the partial model of the previous iteration to evolve and refine till get integrated model for the entire organization. Whenever possible, formal models are built, using a specific tool for modelling (enterprise architecture) that supports the integration of the models and its future implementation. IM and KM model adopts enterprise architecture concept in order to transform business vision and strategies into effective changes. Based on the current situation understanding we plan what we desire for the future and establish the necessary actions for change.

The IAs identified in the current situation (as is) are the basis for the following surveys and preparation of models, being one of the integrative elements of IM and KM model. All IAs identified are analyzed from a systemic view and a proposal for structuring / restructuring them, necessary to fulfil the business requirements can be incorporated into the modelling of the desired situation (to be). All proposals are discussed with representatives of organization strategic areas.

IM and KM models represent a synthesis of the results of various research fields: managing, R&D, production engineering, systems and software engineering, transportation engineering and

ontology. So, model integrates different knowledge areas, which are traditionally presented separately in the literature. To build IM model, the following formal specific models are produced:

- A model of business requirements that describes the services provided by the organization and the logical model of information (structural view information) necessary for the performance of these services. The use cases model defines business requirements into an appropriate standard to be met by the development of information systems. And the information model establishes the business objects (information) to be managed by the relevant information systems and specifies the need to share these objects between systems (Benevides, 2010; Larman, 2005; Kroll and Kruchten, 2003).
- A Map of Information Flow establishing, at a high level, how the information is handled, considering life cycle of information: we analyze, for each information asset, the seven stages taken by information: collection, validation, processing, storage and retrieval, distribution and spreading (Zack, 1999) and gaps to be fulfilled are identified.
- Ontology Models are also used to structure the Agency information for remove ambiguities, inconsistencies and incompleteness; allow the computer systems creation for decision support using a semantic information basis and define a glossary of terms specifying the meaning and the relationship between them (Guizzardi, 2005).

For IM model be successfully practiced it is necessary to develop a set of information management policies that include priorities policy of meeting the demands, aligned with the organization's strategic planning; development systems process; and processes which ensure adherence to IM models; security policy and information access and identity management, respecting the access requirements set out in requirements models and information flow; systems integration policies (including external systems); policies that ensure the integration between IM and IT Management components.

We emphasize the close relationship between IM and IT Management. To enable the correct storage and use of information is fundamental to get IT support, a set of business support systems developed and / or managed by IT that respects the component models for IM. Moreover, it is necessary to establish the dependencies of these various components.

There is a strong dependency between KM Models and information flow map. For building KM model, formal models are produced:

- A knowledge model based on mapping skills, knowledge and professionals, related to IAs processing. Knowledge models identify the forms of knowledge construction and mobilization skills by professionals, relevant to business processes and information flow. KM Model map and represent knowledge / skills / professionals (Bastos et al., 2011; Rezende et al., 2012), analyze knowledge flow, the steps of collecting and mobilizing knowledge to generate innovation (Sabbag, 2007) and the processes of knowledge conversion (Nonaka and Takeuchi, 1997), supporting the construction of an architecture and propose tools and practices that may support KM in the organization.

- The workflow construction of the current situation, detailing the procedures used by employees to conduct activities in the processing of IAs, enables a better understanding of the functioning of the organization. We can identify gaps in knowledge flow, associated to the steps of capturing, mobilization and innovation, and the processes of knowledge conversion (Bastos et al., 2011; Rezende et al., 2012).

- A Knowledge Tree that allows visualize in a hierarchical way all knowledge identified, showing all expertise that can be shared (Lévy and Authier, 1995).

KM, as IM, also needs to be aligned to the strategic planning and governance policies of the organization so that the deployed goals of the strategic map can guide the process of converting tacit knowledge into explicit and vice versa and the continuous knowledge flow to achieve organization mission. Based on the strategic plan and its components, the organization defines its KM vision and establishes the policies needed to achieve KM goals. Policies will be unfold in guidelines that may include five dimensions: a) organizational intelligence b) intellectual capital management c) change management, skills and talents; d) corporate education, e) organizational learning. These can be implemented in waves and gradually, facilitating cultural change and new procedures adoption, mainly those related to work and cooperative learning, use of critical analysis in conducting the activities, adoption of a creative attitude and innovation.

Organizations that embark on KM implementation must have a good understanding of the context and the existing organizational culture, to develop implementation strategies appropriate to consider the specific needs of the organization (Damodaran and Olphert, 2000). In the case of public companies, knowledge of contextual factors and, specially, the needs of the citizen and society are critical success factors. Heisig (2009 as cited in Batista, 2012) points as KM critical success factors: human (culture, people, leadership), organizational (process and structure), and technology (infrastructure and applications) and management processes (strategies, objectives and measurement). Two models act as integrating elements of IM and KM models: first, the ontology model, that defines formally the manipulated information and semantic processes, domains and functions, ensuring the reliability of information and facilitating the integration of knowledge. The modelling of each domain is relevant because it formalizes the information and treats them semantically to ensure consistency, correctness and completeness. This modelling enables the effective exchange of information for different users, can be individuals, workgroups or computer systems.

The second integrator element is the improvement model. An evaluation of the current situation status (as is) with the projection for the desired situation (to be) in which the stages of information life cycle, knowledge flow and knowledge conversion processes are complete for all IAs, leads to the proposition of improvements recommendations, which are reflected in the desired situation models (to be). The improvements model contains recommendations that can be prioritized and further implemented project by project, especially those dealing with: a) the revision, completeness, uniformity and restructuring of IAs; b) the deployment of tools and techniques relating to the information life cycle, knowledge flow and knowledge conversion processes; c) development of applications, tools and systems for IM and KM d) training activities and organizational learning.

Studies have shown that KM systems cannot be implemented unless they represent the potential to be learned and understood by those involved. The main barriers to KM include the lack of learning opportunities. (Damodaran & Olphert, 2000). According to Garvin (1993), learning organizations are those that have five key skills: a) to solve problems systematically, b) to experience, adopting new approaches c) to learn from their own experiences and history; d) to learn from the

experiences and best practices of others, and e) to transfer knowledge quickly and efficiently throughout the organization. Thus, methodology is completed with the formulation and implementation of training plans. Performance indicators are established to monitor progress, feeding back the model permanently.

The main distinguishing feature of the model is to use a specific methodology that brings together several theories, methods and tools in the areas of IM and KM. The combination of complex elements in an integrated model is the innovative element resulting from this work is process.

4 PROJECT STATUS

The ongoing project started in December 2010 and is its closure scheduled in April 2014. Eleven Organizational Units will be modelled, which comprise the main tasks of Agency regarding its bylaw. Till now, the study was completed in six Units, resulting in the delivery of partial models, which are being gradually consolidated. The Enterprise Architect (EA) has been used as a modelling tool and model integration and as a way of representing and understanding the current situation and what is desired for the future.

At the end of the project, the following benefits are expected: understanding of strategic IAs that support business, its flows, structure and related knowledge; identification of knowledge existed in the agency and where they are located, in order to be managed and integrated; adoption of conversion processes and knowledge creation, leading to exploitation of new knowledge; more efficient communication forms; development of new learning practices; creation of communities of practice for structuring the experiences of individuals and teams, contributing for construct an environment for the emergence of new ideas and solutions, making knowledge accessible and focused; availability of tools for decision making support and intelligence in regulation and oversight on transport, with inputs for effective governance, leading to critical analysis of the available information and the regulatory process more efficient, information integrated system and reliable information for decision making; definition of a glossary of terms specifying the meaning and relationship between them, allowed the retrieval of unstructured information, based on semantic, basis for the development of decision support systems; contribution to the culture of treatment and

dissemination of information and knowledge, with agility, transparency and reliability.

5 CONCLUSIONS

This paper discussed a methodology for building an integrated model of information management (IM) and knowledge management (KM).

Based on the concepts that support IM and KM, it was aimed to discuss that: information and knowledge are complementary and mutually supportive; IM is the foundation for KM; IM and KM models can be constructed based on strategic IAs identification; and ontology models and improvements model can be used as integrative elements of IM and KM integrated model.

IM and KM integrated model characteristics were presented, as well as the building methodology.

The project raises research questions, which can be exploited to be answered: how to better integrate the different models constructed; exploitation of those areas that are essential to IM and KM and must work together in order to enhance IM and KM models; measurement of IAs value and importance; IM and KM maturity models; and also development of a management framework that can be used to automate models and support decision making.

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