Modelling and Knowledge Management in the Field of Road Infrastructure Operation and Regulation
Study on the Methods Application in an Organizational Unit

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Abstract: This paper presents the application of an Interactive Method for Modelling and Knowledge Management on Business Environment for an Organizational Unit of Road Infrastructure Operation, from the Brazilian National Ground Transport Agency. As part of an innovative project named MIKM for the Knowledge and Information Manage Model of this agency adopts Knowledge Management fundamental concepts, knowledge and competence, mobilized by professionals on their activities for building information goods. For the method's development and application were needed activities of identification, collection, mapping, representation and analysis of the knowledge and competences needed to the execution of the activities related to knowledge assets of the already mentioned Organizational Unit. Materials and documentation available were analyzed and techniques of meetings and interviews with managers and employees in the steps of identification and collection; for mapping a methodology developed by Rezende (2007) and a knowledge tree concept (Authier and Lévy, 1992) was applied. On knowledge management's analysis and improvement proposals the knowledge conversion modes (Nonaka and Takeuchi, 2009) about knowledge flow, from Road Infrastructure Cycle of Regulation.

1 INTRODUCTION

Communications and information technologies development enabled society to realize structural changes on economics, financial, productive and cultural spheres. Currently the largest value of organizations is intangible, intellectual capital and knowledge, mobilized by its employees on the development of their processes and activities. For an organization to be in a sustainable and competitive level it needs to operate in an increasingly dynamic knowledge environment, focused on new products development, new and more flexible processes. Knowledge Management (KM) area has as its object of study to develop methods, techniques and tools that allow the organization to identify, locate, classify, store and retrieve, distribute, disseminate, recreate and apply knowledge as input for the development of intellectual capital and social capital through effective services. The article presents the MIKM, Model of Information and Knowledge Management (MIKM, 2011), by an iterative methodology, incorporating well known practices of information and knowledge modelling to develop a single management model. The Iterative Method for Modelling and Knowledge Management (INNKM) is part of MIKM and it was applied in a Corporate Environment, an Organizational Unit (OU) of the National Ground Transport Agency (NGTA), detailing the mapping and modelling process of relationships among knowledge, competences and working groups. The method is based upon the concepts of knowledge, competence, skills and

working group proposed by Fleury and Fleury (2004) and Zarifian (2005), whereas the collection and mapping methodology used was developed by Rezende (Rezende, 2007). The construction of the maps of knowledge, competences and working groups was done by using the tree of knowledge (Authier and Lévy, 1992). The processes of knowledge conversion, proposed by the SECI model (Nonaka and Takeuchi, 1995, 2009), were used to analyze gaps in the flow of knowledge.
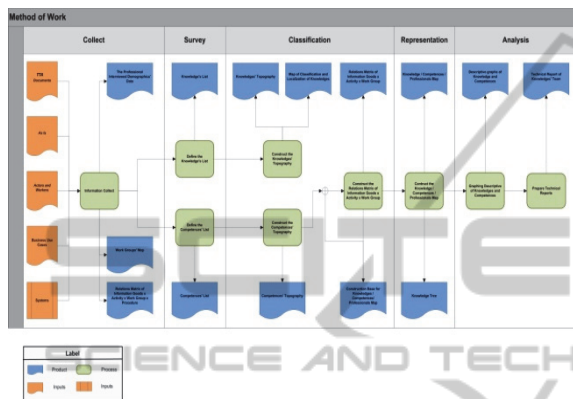

Figure 1: Method of Work for collection, assessment, modelling, analysis and representation of knowledge/ Competences.

2 OBJECTIVES

The main objective of this study was both to identify and to map the existent relations among knowledge, competences and working group in the OU dedicated to Road Infrastructure Operation as well as the information goods in this context. The knowledge, competences and working groups were considered in relation to existing activities and information flows. Consequently, it was carried out the survey so that it could be built up the map of relationships between knowledge, competences and working groups need to do each working activity. This map can be used by to improve OU decision making as it allows the organization to integrate the information among its employees and it improves the sharing level among them. The maps help the elicitation of knowledge, transforming tacit knowledge into explicit one, whereas it helps the understanding of working processes and the identification of new knowledge unidentified so far, the identification of experts to existing activities, the possibility of constructing more efficient forms of communication, development of new ways of learning, building of community work, the

structuring of both individual and team experiences. Thus the organization enters a more fertile ground of new ideas and creative problem-solving can exist.

3 DEVELOPMENT AND CONSTRUCTION OF MODELS

The analysis of knowledge and its management was used the knowledge spiral of the SECI model and the concepts of KM proposed by Takeuchi (Takeuchi et al, 2011). Figure 1 illustrates the method indicating its steps: a) information gathering, b) survey of knowledge and Competences; c) classification; d) representation; e) analysis.
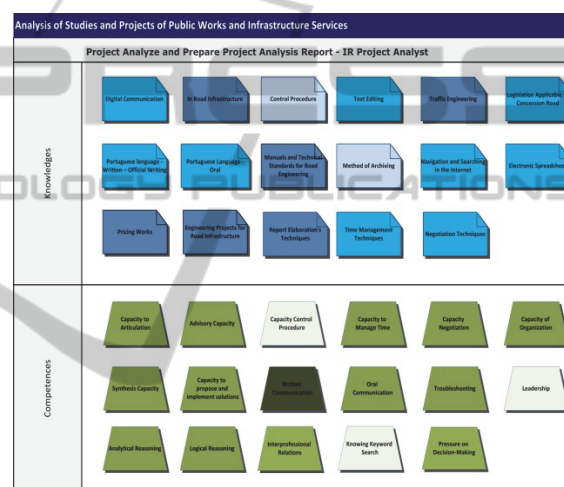

Figure 2: Map of Knowledge/Competences/Working group.

The first step, information gathering, was conducted through interviews with workers and it aimed to identify all the information necessary for the construction of models, since these individuals have expertise and working experience. This step has two stages; the first is to gather the information and knowledge needed, which were considered: a) all documents and existing systems in this OU or used by it; b) the list of information goods; c) As Is models (describing the present processes); and d) actors, workers, working groups and use Business Use Cases methodology. After that, the list of professionals to be interviewed is defined.

The interviews were open by nature, seeking to establish a relationship of trust and respect with interviewees to achieve a level of commitment and information reliability. The interviews were detailed, sought to identify the existing explicit and tacit knowledge and competences necessary to perform

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their activities. The data collection generated a matrix of information goods x interviewees x working group and the demographics data of the interviewed professionals. The second step was to survey, which allowed the definition of knowledge and competences needed for activities of information goods for working group. Thus, lists of knowledge and competences were done (Figure 1). The third step, the classification, builds the topographies of knowledge and competences. The first one consists of its type (tacit or explicit), weight of relevance (irrelevant, less relevant, relevant and very relevant), level of knowledge (basic, intermediate and advanced) and its location. The topography of competences consisted of the weight of relevance (irrelevant, less relevant, relevant and very important) and its location. Based on those was built the map of information goods x activities x working groups. The fourth stage was the representation one that constructed the map of knowledge, competences and working groups (Figure 2) and the tree of knowledge to view the knowledge in a hierarchical (Figure 3). Another use of this analysis is as a tool in the evaluating process of employee performance.
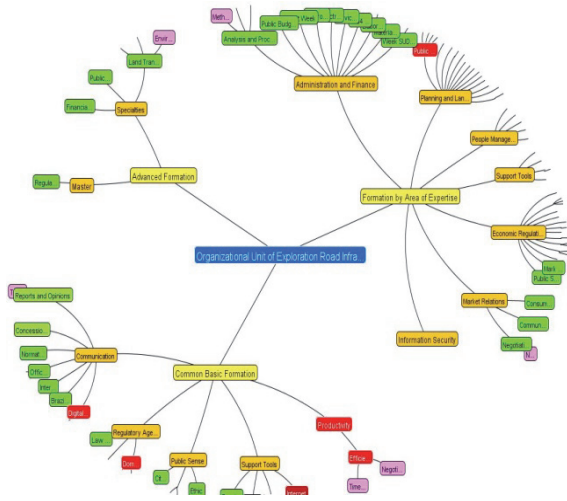

Figure 3: Tree of Knowledge.

At the last step, the analysis, descriptive graphics were constructed from different possible groupings of information and knowledge obtained. Another level of analysis was the identification of gaps in relation to the SECI model. It was still possible to investigate the existence of new correlations between Competences and knowledge that may indicate new relationships associated with information goods, activities and working groups. According to the topics of the training plan of the

Agency was established a classification for the expertise identified. This classification was ranked and then used for developing a information good entitled "Analysis of Studies and Projects of Works and Infrastructure Services," for all working groups involved in the execution of all activities associated with, the relevant weights. Another knowledge classification was done by weighted average of the importance levels of knowledge. This descriptive analysis influences in defining the employee knowledge to perform the activities efficiently.

4 PROPOSALS FOR TECHNICAL, BEST PRACTICES AND KM TOOLS

According to the spiral of knowledge (four modes of knowledge conversion: socialization, externalization, combination and internalization) processes are not carried out in constructing knowledge. In the elicitation process (consists of transforming tacit knowledge into explicit one), knowledge is found in documentary form, but is not organized in a systematic way. Therefore, the OA could benefit in using an Electronic Document Management system. To make more efficient the use of the information good "Analysis of the study and construction projects and infrastructure services," it should be stored in a database corporate all information required to project submission to be presented by the concessionaires to the Agency. Regarding socialization process, which consists in sharing individual and collective experiences, it was identified a manager organizing workshops. This can be taken to other areas to develop knowledge and skills for this practice. It is important to organize events to the concessionaires in order to exchange knowledge and practices on road operations. Another practice is to create a discussion forum for best practices and experiences on specialized topics having for the concessionaires, regional units and other stakeholders. In these forums would be released the most relevant results arising from the events. Regarding the combination process, the absence of a centralized, integrated and consolidated database makes difficulty the systematic use of needed knowledge to carry out different activities.

The absence of a shared database, the process of internalization suffers, since its employees are overloaded with daily tasks that could be done by using management and technological tools. Thus, the time to learn, reflect, evaluate and reconstruct

the knowledge available, as well as their practices and experiences, is greatly reduced. Losses involving its employees imply the avoidance of knowledge and competences, which often have not been socialized, externalized and not combined, and thus may be lost. It is recommended to use the organizational portal as focal point to the OU. For the knowledge transfer, it is recommended the use of methods supported by technology such as: the Virtual Classroom, which consists of a learning network for discussions and interactions at distance. It identifies in the an organizational culture to the creation of communities of practice, entailing a database of lessons learned, database of practices, database of technical alerts and yellow pages, complete with discussion forums The adoption of the suggested improvements will contribute to organizational learning to the extent that such knowledge is transparent disseminated and can be retrieved, manipulated, developed and disseminated. That creates an environment where new tacit knowledge appears, demanding that new processes take place, allowing a new cycle of knowledge.

5 CONCLUSIONS

The INNKM in Corporate Environments was effective in its application, allowing identifying, collect, mapping, representing and analyzing knowledge, Competences and working groups mobilized and involved in building an information goods in the field of Ground Transportation Regulation. As results new information goods have been created and some have been modified in its structure to better meet the agency's mission and the society expectations. The developed models allowed the identification of tacit and explicit knowledge and analyze the flow of knowledge in their steps: identification, representation, validation, storage, retrieval, dissemination, distribution and recreation, indicating gaps and improvement needs. The identified critical success factors of KM assist OU managers decisions in process improvements using KM; indication of necessary knowledge in bidding for public contracts, new training courses and regular training, identification of gaps between the individuals and working groups knowledge and competences needed to perform their activities, among others. With respect to KM were identified eight new tools necessary for the agency. From the knowledge base, built during the modelling process can be made several descriptive analysis. Finally, managers will have at their disposal an incremental

basis of knowledge, unique to the agency, which will enable different analysis depending on need and the decision to be made. With all mapping and modelling all completed will be possible to structure agency's Architecture of KM and set methods, techniques, technologies and appropriate tools for their effective management of knowledge, allowing it to fulfil its mission more effectively and meet the needs of society.

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