

INTEGRATING CURRENT PRACTICES AND INFORMATION SYSTEMS IN KM INITIATIVES

A Knowledge Management Audit Approach

Oscar M. Rodríguez-Elias, Cesar E. Rose-Gómez
*Division of Graduate Studies and Research, Institute of Technology of Hermosillo
Ave. Tecnológico, Hermosillo, Son., Mexico*

Aurora Vizcaíno
Informatics Higer School, University of Castilla-La Mancha, Ciudad Real, Spain

Ana I. Martíenz-García
Computer Science Department, CICESE Research Center, Ensenada, B.C., Mexico

SCITEPRESS
SCIENCE AND TECHNOLOGY PUBLICATIONS

Keywords: Knowledge Management, Knowledge Audit, KM Audit, Knowledge Flow Analysis, KM Process Improvement.

Abstract: Researchers and practitioners in the field of knowledge management have observed the need of performing studies to understand the context and specific knowledge workers' needs before proposing strategies or systems that may not be entirely useful for organizations, resulting in costly and unsuccessful knowledge management projects. Different approaches have been proposed to face this problem, such as process engineering techniques to integrate knowledge management in business processes, and also knowledge audits to identify the knowledge and knowledge problems in organizations. This paper draws on the idea of the knowledge audit to propose a methodology for knowledge management audits, which integrates process engineering techniques and the main tasks of knowledge audits. The methodology was developed based on one of our previous works, literature review, and our own experience in field studies. The methodology, its constitutive phases and main tasks, together with some aspects about its use in field studies, including benefits and weaknesses, are described.

1 INTRODUCTION

Although the Knowledge Management (KM) field has been in the interest of practitioners and researchers for more than a decade, many KM initiatives are still being unsuccessfully implemented. The reasons for KM failures have been under investigation from different perspectives, and different authors have written their opinions on this respect. For instance, Stewart (2002) analyzed different KM initiatives and found that much of them tend to fail because a lack of understanding of the real needs of organizations. In recent years, researchers in the field of KM have getting more attention towards the need for understanding the real

necessities not just of the managerial positions of organizations, or of the organization as a whole entity, but the particular requirements of knowledge workers at all the levels of an organization. For instance, Karl Wiig (2004) has developed a whole theory on the need for people focused on KM.

Based on the observations of other authors, we can state that for KM to be effective, organizations must start looking for what it is really important for their knowledge workers (Wiig, 2004), as well as identifying means to integrate KM into the daily work processes (Scholl, König, Meyer, & Heisig, 2004) and into the daily working tools (Davenport, 2007). All this is particularly true for small companies, which often do not have the resources to

engage themselves in costly and time consuming KM efforts (Wong, 2005). As has been observed by Sparrow (2001), before implementing a KM initiative, small firms have to see the implications of KM into their current processes. This implies to understand the particular context of such organizations in terms of the KM practices that they could be actually applying, trying to harness those current practices, and their current working tools by integrating those as part of the KM efforts. In this scenario, a KM audit should be the first step towards the implementation of KM, particularly in small companies.

In this paper, we describe a KM audit approach developed to study and understand knowledge needs in organizational processes, with a focus on the identification of the current practices and the Information System (IS) that might be contributing, either explicitly or implicitly, to KM activities. The remain of this paper is organized as follows: first, in Section two we introduce the foundations for the methodology, which is described in Section three. Then, in Section four we present some scenarios in which the methodology has been applied, together with the main results of such studies. Afterwards, in Section five we discuss about some lessons we have learned during our work, and about the work to be done; to finally conclude in Section six.

2 TOWARDS KM AUDIT

In this paper, we are proposing KM audit as an extension of the concept of Knowledge Audit (KA). Hence, we will first depict on the Knowledge Audit concept and on the works we have studied to develop our proposal.

2.1 Knowledge Audit

According to Lauer & Tanniru (2001), a knowledge audit (KA) is to understand the processes that constitute the activities of a knowledge worker, and see how well they address the “knowledge goals” of the organization.

Liebowitz, Rubenstein-Montano, McCaw, Buchwalter, & Browning (2000) define a KA as a tool that assesses potential stores of knowledge. By discovering what knowledge is possessed, it is then possible to find the most effective method of storage and dissemination. It can then be used as the basis for evaluating the extent to which change needs to be introduced to the enterprise.

The KA is used to provide a sound investigation into the organization’s knowledge health. It examines knowledge sources and use: how and why knowledge is acquired, accessed, disseminated, shared and used (Hylton, 2002).

According to literature, Perez-Soltero, Barcelo-Valenzuela, Sanchez-Schmitz, & Rodriguez-Elias (2009) have identified that the benefits that an organization might obtain by carrying out a KA include the following:

- Providing scientific evidence to determine if the potential value of the company’s knowledge is maximizing.
- Offering evidence and formalized accounting of existing knowledge within the organization as well as how it moves through the company.
- Detailing in the knowledge inventory “what knowledge exists and where it is in the organization”, which is crucial to determine the abundance and worth of corporate knowledge.
- Allowing for the creation of a map detailing internal and external knowledge and its flow, besides formal and informal social networks. This facilitates to identify the inefficiencies that take place when there are duplicate efforts, knowledge voids and bottle necks in the knowledge flow.
- Helping the company to identify and plan the knowledge required to support its goals, tasks, and activities.
- Allowing for the measurement of the relative worth of knowledge entities as perceived by initiators and users (e.g. employees).
- Offering measurement and the valuation of the efficacy of the company’s capacities and competences with respect to knowledge and KM when compared to clients, partners, and even competitors.
- It facilitates the measurement of the effectiveness and efficiency of knowledge capture by the company and the success with which the captured knowledge is used to support the interests of outsiders such as partners and clients.
- Allowing hidden knowledge to become visible, knowledge assets to become more tangible and, therefore, facilitates activities focused on accounting for them and their measurement.
- Making it easier for KM initiatives to become more efficient and effective.
- Producing independent and objective indicators based on knowledge values that can be used to plan and implement KM projects. Such measures being far richer than measures that only focus on the success or failure of particular KM initiatives.

Additionally, Rodríguez-Elias, Martínez-García, Vizcaíno, Favela, & Piattini (2009) have identified that some of the benefits a company might obtain by studying the knowledge involved in their processes include the followings:

- Identify knowledge related problems.
- Increase the information of the knowledge and knowledge sources involved in the processes.
- Identify tools that can be integrated within the KM initiative.
- Identify requirements in order to acquire or develop new tools through which to improve the knowledge flow.
- Analyze the effects of including KM strategies in the processes.
- Improve the assignment of human resources.

From all the above, we can observe that understanding knowledge needs may get great benefits to an organization, so we agree that this understanding should be an important first step towards the development of KM initiatives.

2.2 The Knowledge Audit Process

According to (Liebowitz, Rubenstein-Montano, McCaw, Buchwalter, & Browning, 2000) a KA can be realized following three main steps:

1. **Identify what Knowledge Currently Exists** in the target area, which include: a) determine existing and potential sinks, sources, flows, and constrains in the target area, including environmental factors that could influence the target area; b) identify and locate explicit and tacit knowledge in the target area, and c) build a knowledge map of the taxonomy and flow of knowledge in the organization in the target area. The knowledge map relates topics, people, documents, ideas, and links to external resources in respective densities, in ways that allow individuals to find the knowledge they need.
2. **Identify what Knowledge is Missing** in the target area, which include: a) perform a gap analysis to determine what knowledge is missing to achieve business goals, and b) determine who needs the missing knowledge.
3. **Provide Recommendations** from the KA to management regarding the status quo and possible improvements to the KM activities.

We believe that in spite of the benefits of a KA, it is not enough since it is also required to identify the mechanisms, activities, and processes that

companies are using to manage what they know. That means, it is also required a KM Audit.

2.3 The KM Audit

Most literature on KA assumes that such activity is carried out in companies which want to implement a KM strategy, and that currently don't have one. However, even when a company would not have explicit KM practices, they use to perform KM activities even when they are not aware of it. At least this fact has found to be true in different field studies (Aurum, Daneshgar, & Ward, 2008; Meehan & Richardson, 2003).

Lauer & Tanniru (2001), state that the goal of a KM audit is "to understand the processes that constitute the activities of a knowledge worker, and see how well they address the knowledge goals of the organization". Thus we define a KM audit as *the identification, analysis and evaluation of the mechanisms, activities, processes and practices being followed to manage the knowledge that a company already has, or to create or acquire the knowledge that this requires to fulfil its goals.*

For a KM initiative to be successful, it is important to identify not just the knowledge we want to manage, but also to identify the mechanisms and activities that the actors of a process currently perform to manage their knowledge. In fact, one of the current concerns in KM practitioners and researchers is to identify the manner in which KM strategies can be integrated to the common working processes, harnessing at most as possible the current working practices and technological infrastructure (Davenport, 2007; Scholl, König, Meyer, & Heisig, 2004). This situation is particularly important for small companies, since they probably would not have the resources for engaging themselves in a costly KM project requiring big changes in their current working processes and technological infrastructure (Sparrow, 2001; Wong, 2005).

Based on literature review and our own experience, we consider that a KM audit should include:

- **A Knowledge Audit** as has been described previously.
- **Identify the Knowledge Goals.** A knowledge goal is a goal that gives direction to KM, and that it is exclusively concerned with knowledge processes, such as knowledge acquisition, creation, sharing, etc. (Lauer & Tanniru, 2001).
- **Identify the Current KM Practices** being performed by actors of the organizational process, and how they aid to the accomplishment

of the knowledge goals. It is important to identify both, formal and informal KM practices. If a company has already implemented a KM initiative, then we could be trying to improve that previous initiative by harnessing what has been functioning well, and improving what is being functioning badly. As well, even when a company would not have formal KM practices, their employees might follow KM activities implicitly, even when they might be unaware that they are doing KM.

- **Identify the Mechanisms being used** by the actors of the organizational process as **KM facilitators**, and the manner in which they influence, positively or negatively, the accomplishment of the knowledge goals. If we want to include current KM practices, we should think on using the current mechanisms that the actors of the process use to manage their knowledge.
- **Identify the Working Tools** being used within the process and that may be being used, or might have the potential to be used as KM tools.
- **Identify the Problems** affecting the well management of the important knowledge for the organizational processes.

2.4 Knowledge Audit Methodologies

Several researchers and practitioners have made proposals for performing KA. For instance, Liebowitz, Rubenstein-Montano, McCaw, Buchwalter, & Browning (2000) have proposed a KA methodology based on a set of key questions oriented to aid in the identification of the knowledge that currently exists, and that missed in a target area. The answers to those questions should provide insights to propose recommendations for possible improvements of KM activities.

Hylton (2002) has developed a methodology for KA focused on auditing the knowledge that people need to do their jobs efficiently. This methodology follows three main steps: 1) a survey for collecting, collating, analyzing and measuring corporate knowledge data and information via the voice of the knowledge people; 2) a knowledge inventory to stock-taking and measurement of tacit and explicit knowledge to determine the actual and potential knowledge wealth, and 3) the building and development of a corporate knowledge map of the structure and flow of knowledge, highlighting who has what knowledge and how they disseminate and share knowledge in the corporate knowledge community.

Choy, Lee, & Cheung (2004) developed a KA methodology of three phases: pre-audit preparation, in-audit process, and post-audit analysis. The pre-audit preparation stage is focused on providing orientation to the KM strategy, and performing a cultural assessment; the in-audit process stage is carried out through structured interviews to capture process-critical knowledge; while post-audit analysis is performed through the use of knowledge inventory, knowledge maps, and social network analysis. The main contribution of this work is that it is proposed as a mean for evaluation whether a company is prepared for starting a KM initiative.

Perez-Soltero et al., (2007) have followed a KA methodology which focuses on the core processes of an organization. That means, the core processes of an organization are choose to be analyzed, where core processes are defined as “collection of cross-functional activities that are essential for external customer satisfaction and achieving the mission of the organization” (p. 9). This methodology consists of ten steps: 1) Acquire organizational strategic information and identify organizational processes; 2) Identify organization’s core processes and establish measurement criteria; 3) Prioritize and select organization’s core processes; 4) Identify key people; 5) Meeting with key people; 6) Obtaining knowledge inventory; 7) Analyzing knowledge flow; 8) Knowledge mapping; 9) Knowledge Audit Reporting; and 10) Continuous Knowledge Re-auditing.

From the analysis of different KA methodologies, Perez-Soltero and his colleagues (2007) have observed that most of them attempt to audit everything, no matter if what it is audited is significant or not to the organization. Thus, the approach of focusing on the core processes of an organization is a better way to perform a KA which focuses on the most important knowledge. However, one weakness of their methodology, and also a weakness of the other KA methodologies we have studied, is that they do not consider, at least explicitly, focusing on the current KM practices and technological infrastructure as the basis for proposing KM solutions. That is why we have used our own approach, but considering the main proposals we have studied in the different KA methodologies found in literature.

From the analysis of the different KA methodologies; we observe that three main stages should be carried out in a KM audit:

1. An information collection stage.
2. A processes analysis stage.
3. A reporting and solutions proposal stage.

The main differences between the KA methodologies are on the techniques used to carry out each of these stages, and the focus of each one of these. From the literature review and our previous research work, we have adapted a methodology for knowledge flow identification (Rodriguez-Elias, Martinez-Garcia, Vizcaino, Favela, & Piattini, 2005), in order to be used as the basis for performing KM audits, also considering some of the strengths we have identified in the KA methodologies just described.

3 A KM AUDIT METHODOLOGY

The KM audit methodology being proposed is based on a previous methodology, which was designed to aid in the analysis of organizational processes from a knowledge flow perspective (Rodriguez-Elias et al., 2005). It was defined to assist in three main areas: 1) to identify, structure, and classify the knowledge that exists in the process studied, 2) to identify the technological infrastructure which supports the process and affects the knowledge flow, and 3) to identify means with which to improve the knowledge flow in the process. In a wide sense, KoFI was designed to propose KM solutions based on the results of a KM audit to specific organizational processes.

KoFI is orientated towards helping to analyze specific work processes, particularly knowledge intensive process. Thus, it considers the focus on core processes proposed in the Perez-Soltero et al. (2007) KA methodology. The process followed to apply the methodology is iterative, since each stage may provide useful information for the preceding stages.

The KoFI methodology has three main phases: knowledge-focused process modelling, analysis of the process (which include identification of knowledge sources, topics, and flows, and knowledge flow problems), and analysis of the tools affecting the knowledge flow.

In order to adapt this methodology to be used as a KM audit methodology we have extended it. This extension includes an explicit phase for data and information gathering; an analysis phase, which is performed following the original analysis phases of the KoFI methodology, and a reporting and solution proposing stage. The figure 1 provides a general view of the extended methodology.

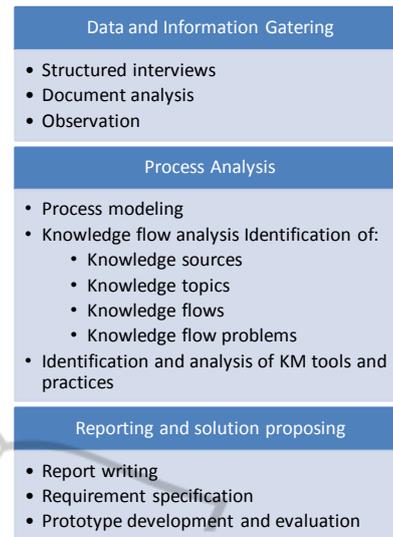


Figure 1: Stages of the KM audit methodology.

In the following subsections we will briefly describe each of the stages of our proposed methodology, together with some techniques and guidelines to carry out each stage. We will focus on the elements that aid to identify the role that current practices and Information Systems plays in the KM activities.

3.1 Information Gathering Phase

This stage is perhaps one of the most important of the whole methodology, since if we do not obtain the correct data it will be highly probable that the results of the following stages will be useless. Unfortunately, we have observed that having a rigorous formal and detailed data gathering protocol could be very difficult to develop and to adapt it to specific organizations' needs. So, we have followed some general guidelines, which are adapted according to the particular situation of each organization, and according to what we observe during each particular case. These general guidelines are as follow:

1. If the researchers have no prior information about the process to be studied, perform long interviews to the main actors of the organization. These interviews should be made to obtain information useful to identify which processes should be analyzed, and who is the people we should talk to first.
2. Identify the people related to the process, the responsible of it, the people who might serve information to the process, the people who might use information from the process, and the

- people who perform the activities required for the process.
3. Perform semi-structured interviews to key people. This key people are those who might have a general view of the process, and which might have a better idea about how the process and its main activities should work. These interviews should be carried out to obtain information about the main activities, and products (inputs, outputs, and internal products) of the process, and to start identifying the main knowledge required and generated during the process, the knowledge sources, and the working tools that might be supporting or affecting the flow of knowledge. Liebowitz, Rubenstein-Montano, McCaw, Buchwalter, & Browning (2000) provide a set of sample questions that can be used as a basis for defining the interviews protocol.
 4. If there are many people performing similar roles into the process, interview just one or two, and use that information to create a questionnaire to perform a survey with the rest of the people, in order to identify similarities and differences.
 5. Identify documents with information about the processes, if they exist to use them to compare them to the information obtained from the interviews, and to complement it.
 6. Perform sessions of observation to validate that the people are really performing the process in the form they have told. Document any differences or additional information to complement or adequate the gathered data.
 7. Create models of the process considering the activities, the roles that people play, the sources of information and knowledge, the main knowledge topics or areas, and the relationships between all these items. This model should be validated by the interviewed people to use them as the basis for the analysis phase.
 8. Perform all these activities in a cyclic way, until researchers and practitioners are conform to the models, and agree that these models really reflect the process being carried out.

3.2 Knowledge Focused Process Modelling

A graphical model of the process, which indentifies the knowledge required or generated, and the knowledge sources and the working tools that may be used as knowledge flow facilitators or channels, is one of the main results of the data gathering

phase, and it is the main source of information for the analysis phase.

In order to use these models for the next stage, it is important to explicitly represent the knowledge and its sources within the model, since integrating elements in an explicit way into a process model, greatly facilitates its analysis (Rodríguez-Elias et al., 2009).

Thus, given the importance of this step, we have been following a graphical process modelling approach that explicitly represents the knowledge and its sources. This approach was proposed in (Rodriguez-Elias et al., 2005), and it is an adaptation of the Rich Picture technique (Monk & Howard, 1998). Figure 2 present an example of this approach. The graphic elements and their possible connections are described next:

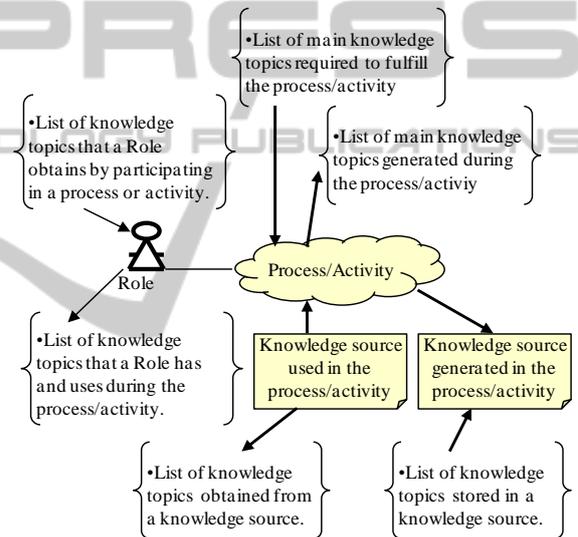


Figure 2: Example of the Rich Pictures notation used.

- **Activities** are represented with a cloud.
- **Roles** are represented with a cartoon of a person, or any other figure that could better reflect what the role is.
- **Knowledge Areas or Topics** are listed within brackets.
- **Knowledge Sources** can be represented with a rectangle, or they can be also represented with another figure to differentiate between each type of source (document, information system, repositories, etc.).
- **Connections** are represented with lines. Just *roles and activities* are connected with undirected lines, this indicates that the role participate in the activity. A line directed *from an activity to a list of knowledge topics*, indicates that that knowledge is generated in the activity; if the line is directed *from*

the list of knowledge topics to the activity, indicates that that knowledge is required to perform the activity. A line directed *from a role to a list of knowledge topics* indicates the knowledge that is extracted from that role, this means, the role has that knowledge and uses it to carry out the activity; a line *from the list of knowledge to a role* is used to indicate that the role obtains that knowledge by participating in the activity. A line *from a knowledge source to an activity* indicates that the source is used in the activity, if the line is directed *from the activity to the source*, then, that source is created in that activity; if the line is bidirectional, then the source is modified in the activity. Finally, a line directed *from a source to a list of knowledge topics* indicates that the knowledge is obtained from the source; if the line is directed *from a list of knowledge to the source* then indicates that the knowledge is stored in the sources during the activity.

3.3 Process Analysis Phase

The process models are a basis for the analysis phase composed of four steps, 1) identification of knowledge sources, 2) identification of knowledge topics, 3) identification of knowledge flows, and 3) identification of knowledge flow problems.

One result of these steps is a knowledge map of the knowledge sources and topics, indicating what knowledge topics are stored in each source, and the relationships of these items with the main activities of the process. To create the map, taxonomies of knowledge sources and topics are developed, which are later used as a basis for an ontology that defines the structure of the map. The map is useful to know where the sources are, how can these be accessed, and in which activities are they required or useful. Additionally, in this stage the main mechanisms being used as knowledge flow channels are identified, such as information systems, documents, key people such as knowledge brokers, knowledge hubs, etc. Finally, a list of the main types of problems affecting the knowledge flows is developed, classifying and describing the problems and its context. Together with each type of problem one or more possible solutions are described in order to latter be used to gather requirements for designing a KM system or strategy.

3.4 Analysis of KM Support Tools

The previous stage helps to identify the main tools being used as knowledge flow channels. We consider that these tools are those that affect

(positively or negatively) to the different KM activities (capture, storage, dissemination, sharing, retrieval, etc.). In this stage, we analyse those tools to evaluate to what level they are supporting the knowledge flow and the different KM activities. To accomplish this, we follow a framework proposed in (Rodriguez-Elias, Martinez-Garcia, Vizcaino, Favela, & Piattini, 2008).

This framework helps to classify each tool according to the purpose of the knowledge managed with it, the people that can be benefited with its use, the domain and structure of the knowledge managed, and the KM activities being supported. Thus, one can specify whether a tool allows managing knowledge within different dimensions. For instance, in the case of knowledge use from personal uses to industry wide use; in the dimension of domain knowledge, from business knowledge to technical knowledge; in the dimension of the structure of knowledge, from highly tacit, such as skills, to highly explicit and structured, such as mathematical formulation; and in the case of the KM activities supported, from a tool that inhibits the flow of knowledge to a tool that improves it.

3.5 Reporting and Solution Proposing

In this final stage, the information obtained and generated during the data gathering and process analysis phases is integrated and structured to document and report to the process administrators the state of the process, the findings of the study, and possible solutions to the problems found.

The report consists of six main sections:

1. **Introduction**, which includes the next subsections: *purpose* describes the purpose and goals of the study carried out, presents a general description of the process or processes studied and their context, and a description of the people to whom the information might be useful; *methodology*, a brief description of the methodology followed, the time consumed, the people involved, and any other data useful to estimate the cost of the study, this section also includes any limitation of the study that might be important to take into consideration; *main findings*, a brief description of the main findings and its implications to the process, to the current KM practices and/or to the possible solutions.
2. **Process Description**, this section presents a detailed description of the current process (or processes) under study. The process models generated and validated during the previous

stages are used to document it in this section of the report. Thus, an important result of the study is a detailed and validated description of the current process, including the main knowledge required and generated during each activity, and the sources used to store it or to acquire it.

3. **Current State of KM Practices**, this section presents a wide description of the current KM practices observed, and the results of the analysis of the tools that support the different KM activities. The description may be presented organized by KM activity, describing the current state of each KM activity.
4. **Knowledge Base**, this section includes a description of the current knowledge base of the process which consists of the taxonomy of knowledge sources and topics, its properties and relationships. The development of an ontology can be a useful mean to structure and document this knowledge base (Perez-Soltero et al., 2009).
5. **KM Problems Observed**, in this section, the main problems affecting the management of knowledge are documented. It is important that these problems are organized and classified. To this end we use problem scenarios, a technique proposed in (Rodríguez-Elias et al., 2005). A problem scenario is a description of a problem in form of a story. Each problem scenario is composed of: 1) a name which briefly describes the problem, 2) a type of problem in which it is classified (such as information loss or difficult to find, knowledge flow bottle neck, etc.); 3) a description of the problem, which is a story that describes how the problem occurs, and that includes its context; and finally 4) one or more alternative scenarios describing how the possible solutions could change the problematic situation. These alternative scenarios are the basis for the recommendations and solutions proposed. Additionally, they can be also used for gathering requirements for designing KM systems for solving the observed KM problems.
6. **Recommendations and Solutions Proposed**. This section is used to sensitize the main problems affecting the flow of knowledge, to make recommendations for improving the flow and the KM practices, and to propose solutions to the problems observed. If the proposal considers the development, modification or acquisition of software tools to face the problems or to implement the improvements, this section also includes the general requirements of such tools.

4 USING THE METHODOLOGY

The development of the proposed methodology has been done following an action research approach (Avison, Lau, Myers, & Nielsen, 1999). This means that we have been using the methodology to study different processes in different scenarios. The results and lessons learned in each case have been used to improve the methodology. This section shall describe the main results of the application of the methodology in each field in which it has been used.

4.1 In the Software Development Field

The first application of the methodology was for studying knowledge needs in a software maintenance process (Rodríguez, Martínez, Vizcaíno, Favela, & Piattini, 2004). In this case we get aware of the importance of considering explicitly in the methodology the identification of current KM practices, and the current tools supporting KM activities. After this, the extensions made to the methodology were used to make a second analysis of the same process. In this second analysis, it was identified one tool being used as the main knowledge flow channel, and the result of the study was the proposal of small improvements to that tool in order reduce the loss of knowledge, increase the capture of knowledge, facilitates its retrieval, and improve its flow.

4.2 In the Manufacturing Field

The second application of the methodology was for studying one of the processes of a manufacturing firm (Rodríguez-Elias, Morán, Labandera, & Vizcaíno, 2008). The result of this study was the development of a knowledge portal for the firm, which facilitates the identification and access to the knowledge and information sources available in the firm, according to the activities that a specific role has to carry out. This is possible since the portal was developed following the structure of the knowledge base defined according to the methodology.

4.3 In the Social Field

A third use of the KM Audit methodology was for studying the processes followed by an organization focused on promoting support for elderly people. Specifically this study was conducted to identify how to help this institution to disseminate their activities and to gather more participants. The result of the study was the documentation of the processes

of this institution, and the inclusion of communication technologies, such as social networks, in the activities of the participants, in order to increase the promotion of their activities. An important result of this study was that it helped us to validate that the proposed process modelling approach was easy to understand for elderly people without knowledge in this field, and that had not interest on learning it.

4.4 In the Academic Field

Currently we are using the methodology as a mean to teach KM systems design to graduate students in a master degree program. The students analyze different processes of a public higher education institution, and propose solutions to one of the main KM problems they find. Until now, we have identified several communication problems between the different departments, and within each department. As a result, some students are designing a knowledge diffusion system for the institution. The system faces the problem of knowledge diffusion in several ways: for employees and students to get aware of what is happening in the institution, and to help them to inform about the results of their main activities; and for the institution to inform the community about its strengths and the knowledge and technological developments it is creating.

5 DISCUSSIONS AND FINAL COMMENTS

The case studies in which the methodology has been applied have taught us the benefits of performing a KM audit before thinking in specific KM solutions. In all the studies, there have been found practices and tools that can be harnessed as part of the KM initiatives proposed; which was one of the main requirements for developing the proposed methodology. However, these projects have also shown us that performing studies of this type are really time consuming. Because of the last, we believe necessary to develop tools to reduce the effort that this type of studies require. In this direction, we are currently developing tools for facilitating the process modelling stage, and the development of the knowledge base of the studied processes. Additionally, we have observed that one weakness of the methodology is the lack of a stage to evaluate its results, and the benefits of the proposed solutions. Unfortunately, the literature in

this field is still scarce, and it shows that much work have to be done yet. Finding a way to perform this evaluation should constitute part of our further work. Additionally, it is important to continue validating the methodology, by applying it in more diverse and complex scenarios, and compare the results to KM studies performed in similar domains.

6 CONCLUSIONS

It is a fact that KM is gaining an increasing interest in almost any sector, either private or public, what is taking organizations from diverse fields and sizes to invest in KM as a mean to make them competitive, and more dramatically, to help them to survive in a rapidly changing environment. Unfortunately, many KM initiatives are still being developed without considering a wide study of the real knowledge needs of the organization's processes and employees, which might provoke for companies or public organizations to waste their money, time, and resources in KM projects that might be unsuccessful.

In this paper we proposed a methodology to perform knowledge management audits as a starting point in the proposal or development of KM initiatives. The methodology is focused on identifying and understanding the knowledge needs in organizational processes by performing a knowledge flow analysis following a process engineering approach. The methodology has been developed from the results of previous works, literature review, and its application in field studies, following an action research approach. The main case studies in which our proposal has been used were also presented in this paper. From these field studies, some observations about the benefits and weaknesses of the methodology emerged, and have given us some insights to our future work, particularly the development of an evaluation stage to drive the evaluation of the results of the methodology, such as the KM solutions proposed.

ACKNOWLEDGEMENTS

We want to acknowledge the financial support of CONACYT and DGEST, in Mexico. Also the partially support of the ENLOBAS (PII2I09-0147-8235) and MELISA (PAC08-0142-3315) projects, Junta de Comunidades de Castilla-La Mancha, Consejería de Educación y Ciencia; the PEGASO project (TIN2009-13718-C02-01), Ministerio de

Educación y Ciencia (Dirección General de Investigación)/ Fondos Europeos de Desarrollo Regional (FEDER), and the FABRUM project (PPT-430000-2008-063), Ministerio de Ciencia e Innovación, in Spain.

REFERENCES

- Aurum, A., Daneshgar, F., & Ward, J. (2008). Investigating Knowledge Management practices in software development organizations – An Australian experience. *Information and Software Technology*, 50(6), 511-533. doi: 10.1016/j.infsof.2007.05.005.
- Avison, D. E., Lau, F., Myers, M. D., & Nielsen, P. A. (1999). Action research. *Communications of the ACM*, 42(1), 94-97. doi: 10.1145/291469.291479.
- Choy, S., Lee, W., & Cheung, C. (2004). A systematic approach for knowledge audit analysis: Integration of knowledge inventory, mapping and knowledge flow analysis. *Journal of Universal Computer Science*, 10(6), 674-682.
- Davenport, T. H. (2007). Information Technology for Knowledge Management. In K. Ichijo & I. Nonaka, *Knowledge Creation and Management* (pp. 97-117). New York: Oxford University Press.
- Hylton, A. (2002). A KM initiative is Unlikely to Succeed without a Knowledge Audit. Proceedings of KMAC2003, the Knowledge Management Aston Conference, *Operational Research Society, Birmingham*. doi: 10.3217/jucs-010-06.
- Lauer, T., & Tanniru, M. (2001). Knowledge Management Audit-a methodology and case study. *Australasian Journal of Information Systems*, 9(1), 23-41.
- Liebowitz, J., Rubenstein-Montano, B., McCaw, D., Buchwalter, J., & Browning, C. (2000). The Knowledge Audit. *Knowledge and Process Management*, 7(1), 3-10. doi: 10.1002/(SICI)1099-1441(200001/03)7:1<3::AID-KPM72>3.0.CO;2-0.
- Meehan, B., & Richardson, I. (2003). Identification of Software Process Knowledge Management. *Software Process: Improvement and Practice*, 7(2), 47-55. doi: 10.1002/spip.154.
- Monk, A., & Howard, S. (1998). The Rich Picture: A Tool for Reasoning About Work Context. *Interactions*, 5(2), 21-30.
- Perez-Soltero, A., Barcelo-Valenzuela, M., Sanchez-Schmitz, G., & Rodriguez-Elias, O. M. (2009). A computer prototype to support knowledge audits in organizations. *Knowledge and Process Management*, 16(3), 124-133. doi: 10.1002/kpm.329.
- Perez-soltero, A., Barcelo-valenzuela, M., Sanchez-schmitz, G., Martin-rubio, F., Palma-mendez, J. T., Vanti, A. A., et al. (2007). A Model and Methodology to Knowledge Auditing Considering Core Processes. *ICFAI Journal of Knowledge Management*, 5(1), 7-23. doi: 10.1.1.72.8091.
- Rodriguez-Elias, O. M., Martinez-Garcia, A. I., Vizcaino, A., Favela, J., & Piattini, M. (2005). Identifying Knowledge Flows in Communities of Practice. In E. Coakes & S. Clarke, *Encyclopedia of Communities of Practice in Information and Knowledge Management* (pp. 210-217). Hershey, PA.: IGI Global.
- Rodriguez-Elias, O. M., Martinez-Garcia, A. I., Vizcaino, A., Favela, J., & Piattini, M. (2008). A framework to analyze information systems as knowledge flow facilitators. *Information and Software Technology*, 50(6), 481-498. doi: 10.1016/j.infsof.2007.07.002.
- Rodriguez-Elias, O. M., Morán, A. L., Labandera, J. I., & Vizcaíno, A. (2008). Improving Knowledge Flow in a Mexican Manufacturing Firm. *Research in Computing Science: Advances in Computer Science and Artificial Intelligence*, 39, 29-45.
- Rodriguez, O. M., Martínez, A. I., Vizcaíno, A., Favela, J., & Piattini, M. (2004). Identifying knowledge management needs in software maintenance groups: a qualitative approach. In *Fifth Mexican International Conference in Computer Science*, 2004. ENC 2004. (pp. 72-79). IEEE Computer Society Press. doi: 10.1109/ENC.2004.1342591.
- Rodríguez-Elias, O. M., Martínez-García, A. I., Vizcaíno, A., Favela, J., & Piattini, M. (2009). Modelling and Analysis of Knowledge Flows in Software Processes through the Extension of the Software Process Engineering Metamodel. *International Journal of Software Engineering and Knowledge Engineering*, 19(2), 185-211. doi: 10.1142/S0218194009004155.
- Scholl, W., König, C., Meyer, B., & Heisig, P. (2004). The future of knowledge management: an international delphi study. *Journal of Knowledge Management*, 8(2), 19-35. doi: 10.1108/13673270410529082.
- Sparrow, J. (2001). Knowledge management in small firms. *Knowledge and Process Management*, 8(1), 3-16. doi: 10.1002/kpm.92.
- Stewart, T. A. (2002). The case against knowledge mangement. Business 2.0. Retrieved from http://www.iwp.jku.at/born/mpwfst/06/cogneon/The_Case_Against_KM.pdf.
- Wiig, K. (2004). *People-focused knowledge management: how effective decision making leads to corporate success*. Amsterdam: Elsevier.
- Wong, K. Y. (2005). Critical success factors for implementing knowledge management in small and medium enterprises. *Industrial Management & Data Systems*, 105(3), 261-279. doi: 10.1108/02635570510590101.