AN ACQUISITION KNOWLEDGE PROCESS FOR SOFTWARE DEVELOPMENT

Knowledge Acquisition for a Software Process Implementation Environment

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Abstract: Knowledge must be managed efficiently through the capture, maintenance and dissemination of it in an organization. However, knowledge related to business processes execution is distributed in documents, corporative systems and in key-members minds making the access, preservation and distribution of this knowledge to other members more difficult. In this context, systematic knowledge acquisition processes are necessary to acquire and preserve organizational knowledge. This work presents a process to acquire tacit and explicit organization members' knowledge related to business processes, and the functionalities of a tool developed to support the execution of this process in a software development context. This tool is part of a software process implementation environment, called *ImPProS*, developed at CIn/UFPE – Center of Informatics/Federal University of Pernambuco.

1 INTRODUCTION

The knowledge management promotes the intellectual capital through the support of the organizational learning and the maintenance of an organizational memory. In this way, the organization acquires abilities to continuously learn about the activities of business processes, besides increasing the knowledge about the customers, technologies and performance areas (Souza, 2003). Organizations that develop software, for example, have highly dynamic business processes, use many technologies and the staff change is often high. Thus, it is very important to manage in an adequate way the knowledge that the members of these organizations have, as well as the knowledge on the technologies used for the accomplishment of the software development activities. In this way, it is possible to improve the processes execution, besides preserving the knowledge when the members leave the organization (Truex, 1999).

The software development process activities are dynamic (i.e., many problems appear during the execution of activities and project decisions must be taken constantly) (Balduino, 2002). The knowledge acquisition used by executants during the development process allows that the organization understands its processes better. However, it is difficult of being carried through, since the developers have difficulties to manage the knowledge due to little or no dedicated time to analyse the problems that happened and on the decisions taken during the accomplishment of the process activities. Thus, the knowledge acquisition process must be integrated to the software development process to reduce the impact in the normal work routine and the effort of knowledge registering. To support this process, an infrastructure of knowledge acquisition must be developed allowing that many knowledge types are captured from multiple sources (Montoni, 2003).

Thus, the definition of a new software process implementation environment was considered, called

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ImPProS (Oliveira, 2005). This environment will make it possible the specification of the processes in accordance with a specific project domain and the characteristics of the organization; the instantiation of the process for projects properties; its simulation from the configuration parameters (stated period, pressures, cost, resources, etc.); its execution based on the organizational process; and its evaluation through metrics collected about its execution.

However, the identification, contextualization, acquisition, use and evolution of the knowledge are not a trivial task in this environment. In order to support the Knowledge Management during the software process implementation in *ImPProS*, we consider a dynamic model of knowledge management and its automation by means of a tool.

Besides this introductory section, the paper presents other four sections. Section 2 describes the properties that compose the software process implementation environment. In section 3 the detailing of the dynamic model of knowledge acquisition is presented. Finally, section 4 presents the final considerations of this paper.

2 *ImPProS*: A SOFTWARE PROCESS IMPLEMENTATION ENVIRONMENT

The *ImPProS* is a project which is being performed at the Center of Informatic of UFPE – Federal University of Pernambuco with the partnership of UNAMA - University of Amazônia, and financed by CNPq - National Agency for Scientific and Technological Development. The objective of *ImPProS* is the creation of an environment to support the implementation of a software process in an organization in a gradual way. The "gradual" term means that the implementation of the process is improved with the experiences learned in its definition, simulation, execution and evaluation. The *ImPProS* is composed of a cooperative environment, formed by nine main tools:

- ***ProDefiner*:** it provides the definition of software process from the analysis of specific characteristics;
- ***ProSimulator*:** it makes possible the simulation of a software process instantiated from an execution plan of the process and thus allows to foresee problems;
- ***ProEnacter*:** it allows the automated execution and monitoring of a software process by a project team;
- ***ProEvaluator*:** it provides the evaluation of software process execution from the analyses of qualitative and quantitative criteria;
- ***ProImprove*:** it makes possible the systematic execution of activities regarding the software process improvement, based on the IDEAL model;
- ***ProAnalyser*:** it allows the analyses and decision taking concerning the evaluation items which compose the software process;
- ***ProReuse*:** it provides the software process reuse from the definition of project scope and its adaptation to the use context;
- ***ProKnowledge*:** it makes possible the collection, analyses and use of knowledge learned during the execution of a software process;
- ***ProConverter*:** it provides the conversion of software process components defined for a process (activities, artefacts, resources, etc.) from the structures of quality norms/models.

3 A KNOWLEDGE ACQUISITION MODEL

This section presents the workflow that describe the acquisition of tacit and explicit knowledge from organization members related to the business processes and the tool developed to support the execution of this process in the software development, the *ProKnowledge*. The explicit knowledge is the one that can easily be expressed through words and numbers or is represented in the documents and data repositories. The knowledge acquired from personal experiences and that is only in the minds of the people is called tacit (Holz, 2001).

The dynamic model of knowledge acquisition defined to *ImPProS* has the purpose of being generic to make it possible the acquisition of different types of knowledge in many contexts and business areas, even so its initial conception has origin in software processes. This model tends to allow the knowledge definition used and created during the execution of business processes in a non-invasive way minimizing, thus, the shunting line of the normal workflow the process executants and preventing delays and imperfections in the execution of its activities. Besides supporting the knowledge acquisition, the model also supports the filtering of the knowledge guarantee that only useful knowledge for the organization are kept in the organizational

knowledge repository. The knowledge revision is also part of the dynamic model of acquisition to adjust the content and the format of the knowledge facilitating its use in different contexts.

The dynamic model considered in this work will be presented by means of workflow. The workflow represents a sequence of activities that are executed to produce a value result for some business actors. The flow uses the primitives presented in Figure 1.

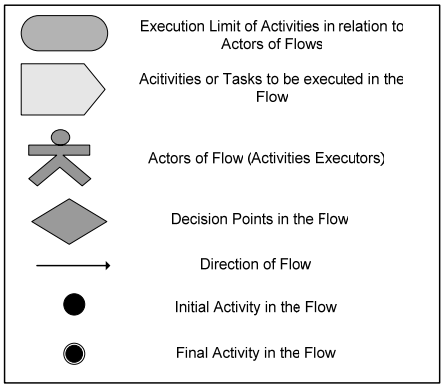

Figure 1: Wokflow Primitives.

A description of the activities, which supply functional support to the knowledge management, defined in the workflow is presented. These activities are characterized as macro-activities in order to group tasks in accordance with its vision of use. Figure 2 illustrates the main flow of these macro-activities and the dependence between them.

a) Keeping Knowledge: this activity aims to acquire from specialists in a process, explicit knowledge about description of the process activities and tacit knowledge used in the taking of decisions about the process activities. The knowledge acquisition can be carried through at two different moments: acquisition independent of the process execution, and; acquisition during the process execution. All the acquired knowledge is stored in an intermediate base to be evaluated by a knowledge evaluation committee. Initially the user defines the context in which the knowledge will be managed (i.e. the application area of the knowledge, for example: Software Processes); later the user needs to define keywords that will allow the indexation and retrieval of the knowledge. Finally, the next step is the identification the type of knowledge that he/she desires to register (for example: Learned lesson, Idea, Doubt, etc.), supplying information referring the type of identified knowledge and registering the knowledge item.

b) Packing Knowledge: the goal of this activity is to adapt the content of evaluated knowledge the intermediate base and to transform the format of acquisition of this knowledge into a format adjusted for its transference. This activity indexes the knowledge in the repository of organization to be recouped during the process execution by members.

c) Filtering Knowledge: this activity aims to verify adequacy the format of representation and the content of knowledge items registered in the intermediate base (i.e. in this activity, it is verified whether the knowledge items have value and if they can be reused). Initially knowledge items are attributed to the evaluation committee members in order to evaluate knowledge items; therefore these members are notified; each member of the evaluation committee must elaborate a point of view of its evaluation according to defined criteria (Correctness, Originality and Relevance, Completeness, Adequacy, Utility, Consistency); thus, the evaluation committee coordinator analysis the individual evaluations, defines the consensus and takes the pertinent decision about the evaluation of knowledge item (Keeping or Removing it from the Knowledge Base).

d) Spreading Knowledge: the goal of this activity is to communicate to the interested public about the new knowledge item available. The communication must contain information about the content of item and its use context.

e) Consulting Knowledge: the purpose of this activity is making it possible that the interested users in the knowledge kept in the organization repository have access and manipulate these information and its applications. The user has still the possibility to visualize details of the knowledge consulted.

f) Inserting Additional Commentary: this activity allows that commentaries of other users about knowledge can also be visualized and kept. These commentaries increase the confidence of the users in the knowledge being consulted due to other users that had used the knowledge and had gotten benefits with its use. The commentaries of users about knowledge can also be useful during the maintenance of the organization repository to identify the knowledge stored that really is bringing benefits for the organization.

4 FINAL CONSIDERATION AND FUTURE WORK

This work presented a proposal for knowledge acquisition independent of the application context of this knowledge. The proposal consists of acquiring, filtering and packing tacit and explicit knowledge of organization members related to the business processes according to a systematic and controlled process.

A tool was developed to support the execution of this process and an application of this tool was carried through in the software development context. This tool was integrated to the *ImPProS* environment and its support tools.

An experimental study is be planned to be executed in the context of micro and small companies which develops software from which one it will be possible to evaluate the benefits of knowledge acquisition approach and to identify improvements to be carried through in this approach. Currently, the tool was applied in the academic context, during the development of research projects by members of the *ImPProS* group at CIn/UFPE.

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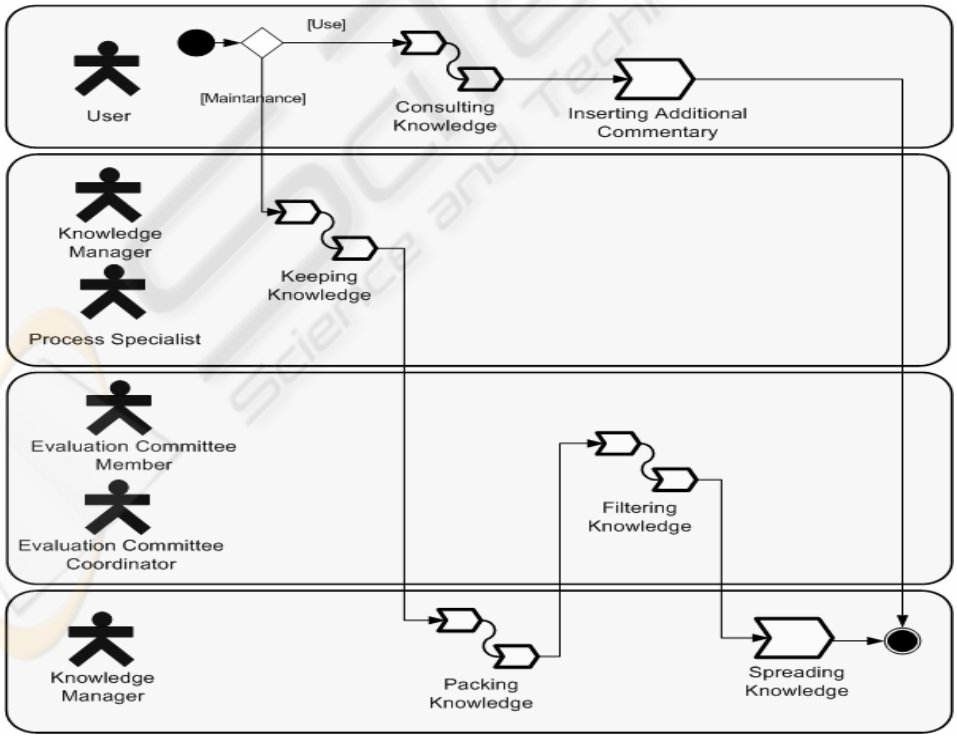

Figure 2: The Knowledge Acquisition Workflow in the *ImPProS*.