

Knowledge Representation and Retrieval in Design Project Memory

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Abstract—Knowledge sharing in general and the contextual access to knowledge in particular, still represent a key challenge in the knowledge management framework. Researchers on semantic web and human machine interface study techniques to enhance this access. For instance, in semantic web, the information retrieval is based on domain ontology. In human machine interface, keeping track of user's activity provides some elements of the context that can guide the access to information. We suggest an approach based on these two key guidelines, whilst avoiding some of their weaknesses. The approach permits a representation of both the context and the design rationale of a project for an efficient access to knowledge. In fact, the method consists of an information retrieval environment that, in the one hand, can infer knowledge, modeled as a semantic network, and on the other hand, is based on the context and the objectives of a specific activity (the design). The environment we defined can also be used to gather similar project elements in order to build classifications of tasks, problems, arguments, etc. produced in a company. These classifications can show the evolution of design strategies in the company.

Keywords—Project Memory, Knowledge re-use, Design rationale, Knowledge representation.

I. INTRODUCTION

KNOWLEDGE sharing is still a main problem to deal with in organizations. Although, studies in semantic web and Human Machine Interface provide techniques to enable a better access to information, these techniques are not sufficient in terms of allowing a contextual access according to user needs. In fact, in the semantic web framework [1], the information access is guided by the ontology of the user domain. However this type of ontology is built as a consensual concept definition of the domain. Therefore, it can be considered as a reference of the concepts used in a given domain while any user generally has her/his own representation of the domain which is more or less close to a domain ontology. Moreover, the structure of the domain ontology is usually provided by a knowledge engineer who introduces her/his own representation to build this ontology. Besides, User activity evolves over the time and, subsequently, her/his information requirement changes

according to the context of her/his activity. Several works on Human Machine Interface [2] study the way to keep track of user activity in order to offer a personalized information retrieval. Studies in Ergonomics prove that information about the objectives and the environment of an activity are essential for a better understanding and an accurate representation of that activity.

In our approach, the above important aspects are taken into account. We focus on the designer activity, in which, tasks and activities can provide relevant information about the objectives of the designer activity. We defined methods and structures for a construction of a memory of design projects focusing, particularly, on the two parts that we consider as essential in such category of projects: the project context and the design rationale [3]. The produced project memory can be considered as a referential resource in an organization. This resource is structured not only as a domain ontology, providing links to relevant documents, but also as a semantic network accurately linking up concepts constituting the project context and the design rationale. The information retrieval procedure is based on semantic relations between these concepts and can, hence, offer a con-textual information access. We used conceptual graphs to represent concepts in a design project as a semantic network structure. We used "Corese" [4] as an information retrieval tool as a semantic search engine. This tool uses conceptual graphs along with RDF and XML formalisms in order to offer a deep and semantic information retrieval.

The rest of this paper describes, in its second and third sections, the designed structures of project memory and a suggested approach that enables the capture and representation of knowledge used and produced during design project. The fourth section argues the need of contextual information retrieval in design. The fifth section describes how a project memory has been represented using conceptual graphs and RDF formalisms. The information retrieval as carried out with Corese (sixth section) is based on the relation between the constructed conceptual graph and its RDF representation.

II. PROJECT MEMORY

In [5], Dieng-Kuntz defines the Knowledge Management cycle as being composed of the following stages: clarification, broadcasting and reuse. Many investigations have presented the corporate memory as a significant support for Knowledge

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