Qualitative Analysis of Semantically Enabled Knowledge Management Systems in Agile Software Engineering

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ABSTRACT:

In many agile software engineering organizations there is not enough time to follow knowledge management processes, to retrieve knowledge in complex processes, or to systematically elicit knowledge. This chapter gives an overview about the human-centered design of semantically-enabled knowledge management systems based on Wikis used in agile software engineering environments. The methodology – developed in the RISE (Reuse in Software Engineering) project – enables and supports the design of human-centered knowledge sharing platforms, such as Wikis. Furthermore, the paper specifies requirements one should keep in mind when building human-centered systems to support knowledge management. A two-phase qualitative analysis showed that the knowledge management system acts as a flexible and customizable view on the information needed during working-time which strongly relieves software engineers from time-consuming retrieval activities. Furthermore, the observations gave some hints about how the software system supports the collection of vital working experiences and how it could be subsequently formed and refined.

Keywords: Agile Software Engineering, Experience Management, Human-centered Design, Riki, Semantically Enabled Knowledge Management Systems, Semantic Wiki, Software Reuse, Wiki

INTRODUCTION

The development of complex software systems is based on company- and domain- specific knowledge that has to be constantly cultivated among the employees, because the resulting quality of manufactured software systems depends on what degree the needed knowledge is actually available (Decker et al., 2005).

Typically, knowledge management (KM) platforms are used to support the knowledge capturing, management, or sharing processes.
within companies. However, in agile software engineering (SE) organizations there is not enough time to follow KM processes, retrieve knowledge in complex processes, or systematically elicit knowledge (e.g., using post-mortem analyses (Birk et al., 2002)). The technical KM platform for agile software organizations should release Software Engineers as much as possible from time-consuming retrieval processes.

Today, due to the various possibilities of searching and browsing through software engineering artifacts, it is assumed that users feel overwhelmed just by the flood of information: while the increasing amount of information itself might not be a problem, an unfiltered and unrated access to it is. When using KM systems, we should never forget that the main goal is to ensure that Software Engineers can deal with their daily tasks without burdening them with additional work.

Hence, we developed a semantically-enabled knowledge management system for SMEs based on a Wiki. This system not only supports the easy retrieval but also acquires valuable pieces of information from users, who publish their problems and experiences during work. Out of the day-to-day work, company- and product-specific knowledge can be built and refined without interfering too much with the daily work. Our approach, which concentrates on essential aspects of an artifact, considers the previous knowledge as well as the interests of the targeted users – provided by semantics encoded in metadata, concept structures and user profiles. It can be used to arrange artifacts in a flexible way depending on the users’ needs (e.g., artifacts written/read by the user and given interests or tasks of the user). Besides that searching the whole system for certain artifacts will present results in a nested or context-based way (e.g., the artifact describing “Pair Programming” is arranged under its parent concept “Extreme Programming” (Beck, 1999a)). This solution is based on underlying Ontologies (Gruber, 1995). After the whole process of selecting certain aspects and restructuring them, users may be provided with complete, self-contained and motivating knowledge.

Our contribution touches several fields, such as Human-Centered Interfaces, Education, and knowledge management with a special focus on Wikis. We tackled the objectives to reduce learning barriers, improve the quality of knowledge, and improve the structure as well as interconnection of knowledge within KM systems. Our contributions comprises of knowledge elicitation techniques, SE-specific didactically improved templates, and semantic relations for SE documents.

In this paper, we present the research methodology (section 2) used in our project to build and evaluate a human-centered and semantically enabled knowledge management system (section 4) as well as the necessary background (section 3) from SE and KM. Several methods to support the users by means of an intelligent application are discussed within in the paper. The qualitative evaluation conducted in the project RISE – including baseline and delta evaluation – is then described in section 5. We give a summary and conclusion in section 6.

**METHODOLOGY**

In order to support the reuse of software engineering products such as requirement documents, we build the semantically enabled knowledge management system Riki (Reuse-oriented Wiki). The Riki was targeted towards ease of use and improved the acceptance by the users (Höcht & Rech, 2006). The methodology and technology developed make it possible to share knowledge in the form of software artifacts, experiences, or best practices based on pedagogic approaches.

**Development Methodology**

Our methodology to develop the Riki was based on the principles of a Human-Centered Design Process according to the international standard ISO 13407, as depicted in Figure 1. It expects that users take an active part in the development process in order to get a clear
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