A Knowledge Management Process in Communities of Practice of Engineering Based on the SECI Model for Knowledge

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ABSTRACT

With the vast movement toward promoting and developing models, practices, and technological environments in the engineering domain, a need exists to facilitate communication, collaboration, and coordination among its actors. Communities of Practice (CoPs) represent the natural and logical solution to answer these needs. In this paper, the authors propose a knowledge management process to exploit tacit and explicit knowledge in the engineering domain within the framework of a CoP of engineering. The approach used in this work introduces new elements in the Nonaka’s SECI model for knowledge creation. To validate the proposed process, a qualitative case study has been conducted on two CoPs, “CPsquare” and “The Cisco Learning Network”. It has been shown that CoPs and social learning impact learning as well as knowledge sharing. The use of web technologies and socio-technical approach in the management of knowledge is of high importance.

Keywords: Communities of Practice, Engineering, Knowledge Creation Process, Knowledge Management, SECI Model

INTRODUCTION

Engineering activities of analysis and design for technical systems are not ends in themselves but are a means for satisfying human needs. In the systems era, successful accomplishment of engineering objectives requires a combination of technical specialties and expertise. Therefore, engineering is a team activity where various individuals involved must be aware of the important relationships between specialties as well as between economic, political, and societal factors. As stated by Blanchard et al. (1998) engineering faces several challenges such as: i) reduction in life-cycle cost including the cost of system design and development, produc-
tion, operation and support, and retirement; ii) reduction in system acquisition time, from the initial identification of a customer needs to the system delivery; iii) more visibility and a reduction in the risks associated with the decision making process. Research has been done to promote and develop good engineering models, practices, and technological environments (CAD: Computer-Aided Design, CAE: Computer-Aided Engineering). However, fewer efforts were deployed to support practitioners of the engineering domain in learning from each other and learning from their past experience on a day-to-day basis. The present research paper proposes a knowledge management process to exploit explicit and tacit knowledge in the domain of engineering within the framework of a Community of Practice (CoP). The approach used introduces new elements in the Nonaka’s SECI model for knowledge creation. The methodology is based on action research focusing on social dimension and learning by doing. We consider knowledge creation as a constructivist learning process where knowledge is constructed collaboratively amongst CoP members. The CoP knowledge in the domain of engineering includes not only the basic knowledge of individual specialty fields but also the knowledge of the best practices captured from the previous developments of systems and products within real projects. To validate the proposed process a qualitative case study has been conducted on two communities of practice, “CPsquare” and “The Cisco Learning Network”. The results of this study reveal that the socio-technical aspects of CoPs have an impact on the community learning and knowledge sharing and thus knowledge of individuals and community is increased.

This paper is organized as follows: the next section introduces the problem statement and shows why a CoP of engineering is a solution to overcome the problem of collaboration and sharing amongst the engineering actors. The knowledge management process related to Nonaka’s SECI model of knowledge creation is then recalled. The following section adapts the model to CoPs and shows how we considered SECI modes as processes and incorporated them into the CoP of engineering. A qualitative analysis based on the proposed model is then applied on two CoPs. Finally the paper is concluded with some discussion and future work.

**PROBLEM STATEMENT**

Engineering activities typically involve people from different domains and disciplines. These differences often produce important information flows and knowledge exchange that are difficult to manage. A broad variety of engineering models, techniques, and technological environments such as Computer-Aided Design and Computer-Aided Engineering tools have been designed and implemented by researchers. However, a lack of efforts was observed in the way engineering practitioners are being supported in their daily activities. There is a need to help engineers manage collaboratively their knowledge and build shared practices. In this context, a CoP of engineering presents a logical and natural solution to overcome the problem of collaboration and sharing amongst these actors. Learning in a community of practitioners often involves learning something in a context where it is immediately useful (i.e. its “use value”) as stated by Lave and Wenger (1991). Recent research on knowledge management (KM) clearly recognizes the importance of CoPs in the creation and maintenance of knowledge within organizations (Davenport & Hall, 2002; Fontaine & Millen, 2004; Kimble & Hildreth, 2004; Palette, 2006; Pan & Leidner, 2003; Wenger, 2004). The basic assumption underlying the theory of CoPs is that engagement in social practice is the fundamental process by which we learn and become who we are (Wenger, 1998). The main objective is to establish a structure where tacit and explicit knowledge are shared and exchanged among various members within a given domain. CoPs present a strategic approach for fostering learning and transferring knowledge through exchange, interaction, and negotiation with learning situated in practice. This differs from traditional perspectives of
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