



A Methodology for Integrating the Social Web Environment in Software Engineering Education

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ABSTRACT

The aim of this article is a technological revitalization of software engineering education from human and social perspectives. It adopts a systematic approach towards integrating the Social Web environment (including technologies and applications based on those technologies) in software engineering education, both inside and outside the classroom. To that regard, a feasibility-sensitive methodology for incorporating the Social Web environment in software engineering education that supports a heterogeneous combination of objectivism and constructivism is proposed and explored. The potential prospects of such integration and related concerns are illustrated by practical examples. [Article copies are available for purchase from InfoSci-on-Demand.com]

Keywords: *Collaboration; Conceptual Modeling; Objectivism; Pedagogical Pattern; Social Constructivism; Software Process*

INTRODUCTION

In the last decade, the discipline of software engineering has gained increasing significance in computer science and engineering education. It is evident that software engineering education (SEE) needs to be sensitive to the variations and evolution of the social and technical environment around it. In particular, any changes in the information technology (IT) environment need to be reflected in SEE, if it leads to viable opportunities and demonstrated benefits. Indeed, there have been calls for a reform of SEE in which technology is given a prominent place (Frailey, 1998; Kamthan, 2008; Shaw, 2000).

The Social Web, or as it is more commonly referred to by the pseudonym Web 2.0 (O'Reilly, 2005), is the perceived evolution of the Web in a direction that is driven by 'collective intelligence', realized by IT, and characterized by user participation, openness, and network effects. For the sake of this article, the Social Web *environment* includes Social Web technologies, applications based on those technologies, and tools for managing both. The focus of this article is to assess the implications of the Social Web environment as it pertains to logistical and pedagogical issues arising in teaching and learning of software engineering, including

interaction between teachers and students, and between students.

The rest of the article is organized as follows. First, the background necessary for later discussion is provided and related work is presented. This is followed by a proposal for a methodology (labeled as SW4SE2 henceforth) that aims for a systematic introduction of the Social Web environment in SEE, both inside and outside the classroom. The prospects of SW4SE2 are illustrated using practical examples. Next, challenges and directions for future research are outlined. Finally, concluding remarks are given.

BACKGROUND AND RELATED WORK

There is a need to foster a social environment in software engineering at several different levels and is increasingly being seen as significant to SEE (Layman et al., 2005). The software process environments, with the client and user involvement, have become increasingly collaborative, of which agile methodologies and Open Source Software (OSS) ecosystems are exemplars.

The human aspect and indeed the social aspect of software engineering trickle down to process workflows. It has long been recognized that requirements elicitation is a social process (Macaulay, 1993). The crucial design decisions, such as selection and application of architectural styles or patterns, often depend upon mutual cooperation. The success of Pair Programming, one of the core practices of Extreme Programming (XP) (Beck & Andres, 2005), intimately depends on the acknowledgement of its social nature (Chong & Hurlbutt, 2007).

However, the technological infrastructure enabling the social component of software engineering has taken time to get established. In the 1970s, the environment to support the social aspect of software engineering was not mature, and in the 1980s, the environment was

largely limited to the use of electronic mail (e-mail). It was the 1990s, particularly the ascent of the Web, that opened new vistas for people that were non-proximal to communicate in a variety of ways on a global scale.

The three primary factors that can be attributed to bringing the vision of the Social Web to a mainstream realization are: (1) the enablement of a many-to-many communication paradigm in which people are primary, technology is secondary, and the Web is merely a broker, (2) the maturation of the underlying technological infrastructure and the availability of its implementations as open source, and (3) the awareness and large-scale participation by the public at-large.

There have been relatively few initiatives so far for integrating the Social Web environment in education. The uses of Wiki for teaching software engineering have been reported (Decker et al., 2006; Decker et al., 2007; Gotel et al., 2007; Parker & Chao, 2007). However, the correspondence to any teaching strategy or learning theory is unclear. A learning process based on the Socialization, Externalization, Combination, Internalization (SECI) model of knowledge management that uses Social Web technologies has been suggested (Chatti et al., 2007). However, the treatment is largely peripheral and one-sided: the precise advantages of Social Web towards teaching and learning are not given and the corresponding limitations have not been pointed out. This is one of the motivations for this article. The limitations of conventional computer-supported collaborative learning (CSCL) are pointed out and, via the introduction of an application, namely eLogbook, the usefulness of next generation of social software in engineering education has been demonstrated (Gillet et al., 2008). However, the treatment of Social Web technologies in it is largely one-sided, and eLogbook is not yet mature and its relationship to other Social Web applications is unclear.

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