Chapter 30

ECHO: A Layered Model for the Design of a Context-Aware Learning Experience

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ABSTRACT

In this chapter, we suggest Echo, a model for utilizing Web technologies for the design of Web-based context-aware learning. Web technologies are continuously evolving to enhance information retrieval, semantic annotation, social interactions, and interactive experiences. However, these technologies do not offer a methodological approach to learning. In this chapter, we offer a new approach to Web-based learning, which considers the role of the user in shaping the learning experience. The key feature in Echo is the analysis and modeling of content for the design of a Web-based learning experience in context. There are three elements in Echo: 1) a methodology to guide the learning process, 2) techniques to support content analysis and modeling activities, and 3) a three-layered framework of social-semantic software. Incorporating this framework facilitates knowledge organization and representation. We describe our model, the methodology, and the three-layered framework. We then present preliminary results from on-going empirical research that demonstrates the feasibility of Echo and its usefulness for the design of a context-aware learning experience. Finally, we discuss the usefulness of Echo and its contribution to further research in the field of Web technologies.

INTRODUCTION

Web-based learning is a multifaceted phenomenon informed by a spectrum of theories. Theories of communication (Alavi & Leidner, 2001; Rafaeli & Raban, 2005; Te’eni, 2001) eLearning (Al-Kahlifa & Davies, 2007; Paavola et al., 2004; Parameswaran & Whinston, 2007; Schmidt, 2005; Schmidt, 2008; Tzitzikas et al., 2006) and eLearning 2.0 (Downes, 2005; Ebner, 2007; O’Hear, 2006) guide the design of the learning processes and media integration. Theories of knowledge management (Grace & Butler, 2005; Nonaka & Tekeuchi, 1995), information science (Hjorland, 1997; Latham, 2002; Muresan...
information retrieval (Feng et al., 2005), organizational memory (Weinberger et al., 2008b) and organizational learning (Argyris & Scon, 1978; Paavola et al., 2004; Weiling, 2006) inform the management of content related aspects. Other research contributions have taken the technology perspective (Ebner et al., 2007; Schmidt, 2008) or focused on specific media (Abel et al., 2004; Bao et al., 2007; Hotho et al., 2006b, Javanovic et al., 2007) to inform the design of learning activities. What is yet lacking is a comprehensive and systematic model of systems and practices for the design of Web-based learning.

In this chapter we define Web-based learning as the manipulation of a set of content analysis techniques aiming to establish a conceptual model of a task specific domain. This definition indicates that the learner is responsible for constructing the learning process in context. Context awareness and the design of a conceptual model are essential to this process since without context the learning experience would be meaningless.

We identified three challenges to be considered as part of the design of context-aware learning. First is the need for a framework of tasks and deliverables required to guide Web-based learning. Such a framework would advise the user about the how (tasks, activities and techniques) and what (deliverables to be developed and social-semantic applications to be used) of this experience. Principles of Organizational Memory life cycle (Weinberger et al., 2008a) could be adapted for the definition of a dedicated methodology, describing the processes and the tasks to be performed. Second is the need to compile a collection of adequate techniques and advise the user about the specific methods for using these techniques to support the advised systematic methodology. Example techniques could follow classification methods and knowledge organization systems, such as taxonomy, thesaurus and ontology (Abel et al., 2004; Christiaens, 2007; Feng et al., 2005; Latham, 2002). However, while these techniques are clearly vital to this end, their association with Web-based learning is not obvious. The third challenge identified for this research is the need to model the learning process in an integrated way towards context-aware learning incorporating social-semantic applications and the adequate techniques.

In this chapter we suggest a balance between technical feasibility (i.e., Web technologies) and human action (i.e., learning). Of the many aspects of Web technologies, we focus on the role of the human agent at the interface between the technology perspective and the content perspective. Specifically, we challenge the way individuals retrieve information from the Web to enhance learning.

This chapter takes a stance towards these challenges to suggest the Echo model for the design of a context-aware learning experience. In Echo we follow principles of Web software development such as Express Programming and Information Science techniques (Hjorlad, 1997; Xia et al., 2006). For the design of our initial framework we follow Paavola, Lipponen & Hakkarainen (2006) theory of Trialogical learning (TL). The TL theory suggests that successful learning occurs when learners collaboratively develop shared objects of activity in a systematic way. In their theory, Paavola et al. (2006) attribute collaborative knowledge creation processes to three learning modes: knowledge acquisition, social participation and collaborative knowledge creation. We adopt this theory and incorporate its elements as a basis for the design of our model.

Echo provides a needed balance between technology and human action and supports peers collaboration. Such a balance has been lacking in previous work, and we believe it reflects a more realistic picture of information retrieval in general and Web-based learning in particular.

There are three contributions in this chapter corresponding to the three elements in Echo. First is a methodology to guide the learning process – advising the tasks, activities and deliverables that are required for a context-aware learning
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