

Chapter 6.5

An Efficient and Effective Approach to Developing Engineering E-Training Courses

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ABSTRACT

In developing traditional learning materials, quality is the key issue to be considered. However, for high technical e-training courses, not only the quality of the learning materials but also the efficiency of developing the courses needs to be taken into consideration. It is a challenging issue for experienced engineers to develop up-to-date e-training courses for inexperienced engineers before further new technologies are proposed. To cope with these problems, a concept relationship-oriented approach is proposed in this paper.

A system for developing e-training courses has been implemented based on the novel approach. Experimental results showed that the novel approach can significantly shorten the time needed for developing e-training courses, such that engineers can receive up-to-date technologies in time.

INTRODUCTION

In recent years, technologies have advanced at an amazingly fast pace; therefore, almost all of the

high technical engineering knowledge and skills need to be updated or replaced with very high frequency; for instance, the engineering knowledge of the semiconductor and the electronics industries. One of the most important management strategies of the modern enterprises is to keep on improving the knowledge and skills of engineers via frequent training and practice. Take Motorola, for instance. The company budgets \$120 billion annually for conducting employee training programs. American IDC (International Data Corp.) predicted that the e-learning market all over the world will triple in the next two years, and will share 40% of the entire training market.

The advantages of e-learning have been documented by researchers (Hwang 1998, 2002; Sun & Chou, 1996), including the feasibility of anytime and anywhere education, the availability of various learning styles, the reduction of education cost, the reusability of well-constructed and well-managed subject material modules, and so forth. Most of the engineering training programs that enterprises scheduled were designed and planned within their own organizations. Senior and experienced engineers of the organizations usually play the role of training instructors and course designers. That is, the responsibility of sharing experiences, skills, and knowledge heavily rely on those experienced engineers. As most of the engineers are not trained for tutoring, it is usually time consuming for them to design learning materials, and the training programs for those up-to-date technologies are often seriously delayed.

To cope with this problem, we shall propose a concept relationship-oriented approach to assisting the engineers in developing e-training courses. A course design system, CRETS (Concept Relationship-based Engineering Training System), has been developed based on the novel approach. Experiment results showed that the novel approach can assist experienced engineers to design quality e-training courses efficiently, and hence inexperienced engineers can receive

up-to-date information of those rapidly advanced technologies.

RELEVANT RESEARCHES

Engineering training is not only a frequent activity but also a heavy burden to enterprises, owing to the rapid advance of new technologies. As engineering courses need to be replaced or updated frequently, researchers have attempted to apply e-training technology to efficiently and effectively develop and manage the learning materials and the training process. For example, a system that can assist in organizing system knowledge and operational information to enhance operation performance was proposed by Vasandani and Govindaraj (1991, 1995); moreover, a system that automatically determines exercise progression and remediation during a training session based on past student performance was presented by Gonzalez and Ingraham (1994). Meanwhile, various techniques and tools for developing intelligent tutoring systems have also been proposed, including the use of a neural networks technique to model student behaviors in the context of intelligent tutoring systems (Harp, Samad, & Villano, 1995), planning methods, consistency enforcement, objects and structured menu tools to construct intelligent simulation-based tutors for procedural skills (Rowe & Galvi, 1998), and technology for detecting online status of students to establish interactive intelligent tutoring system (Hwang, 1998; Giraffa, Mora, & Vicari, 1999). It can be observed that such e-learning or e-training systems have been widely applied to schools and industries recently (Ozdemir & Alpaslan, 2000; Hwang, 2002).

E-training approach has shown its superiority, such as the fact that skills and knowledge of experienced engineers can be retained and transferred to new employees, the learners are allowed to receive training courses without being limited by space and time, and so forth. However,

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