Chapter 3.14
SEAMAN:
A Visual Language-Based Tool for E-Learning Processes

Gennaro Costagliola
University of Salerno, Italy

Filomena Ferrucci
University of Salerno, Italy

Giuseppe Polese
University of Salerno, Italy

Giuseppe Scanniello
University of Basilicata, Italy

ABSTRACT

One of the crucial activities in the development of e-learning courses concerns the design phase. In this phase, instructional designers define the e-learning processes by specifying the activities students should carry out (knowledge objects, assessment, practice, etc.) and their temporal sequence. This phase is usually performed using an iterative process, with step-by-step refinements. Thus, it can greatly benefit of the availability of tools that assist instruction designers to carry out their work. In particular, a rapid prototyping approach could be effectively supported if the tool is also able to automatically generate the courses starting from the supplied specification. Moreover, such a tool should also provide support for reuse. To fulfil these requirements, in this chapter we present a tool based on a suite of visual languages, which has been specifically conceived to support instructional designers in the definition and creation of learning processes. The use of visual languages is motivated by the success they have achieved in other contexts (e.g., software engineering) for the construction of suitable models that allows to focus only on the features of interest and to provide more effective descriptions and reasoning. The proposed suite of visual languages includes the learning activity diagram, which extends UML activity diagrams to make

DOI: 10.4018/978-1-60960-503-2.ch314

them suitable for modelling e-learning processes, the Self-Consistent Learning Object language used to define knowledge contents, and the Test Maker Language for specifying assessment and self-assessment tests. The visual languages have been then implemented in SEAMAN (System for E-Learning Activity MANagement), a system prototype conceived to support instructional designers in the design, the generation, and the deployment of e-learning processes.

INTRODUCTION

E-learning or electronic learning is a general term used to refer to computer-enhanced learning. The most notable advantages of e-learning are flexibility, convenience, and the ability to work at your own pace. In particular, groups of students participate and complete coursework enjoying e-learning activities in accordance with their daily commitments, thus making e-learning a viable alternative for learners with disabilities or those that have other commitments such as family or work.

One of the crucial activities in the development of e-learning courses concerns the design phase. In this phase, instructional designers define the e-learning processes by specifying the activities students should carry out (knowledge objects, assessment, practice, etc.) and their temporal sequence. The e-learning evolution proposes a good number of approaches and tools aimed at assisting instructional designers during the analysis, design, and delivery of instruction (Bruce & Sleeman, 2000; Campbell & Mahling, 1999; Designer's Edge, 2003; Goodyear, 1997; Schar & Kriger, 2000; Vrasidas, 2002). Many instruction design approaches proposed in the literature are based on traditional pedagogical learning approaches, or on the object-oriented paradigm. Indeed, existing models of instruction design have been influenced by linear or object-oriented software development processes. Nowadays, the new trend consists of exploiting ideas and benefits of component-based approaches for implementing and delivering learning environments. In particular, the idea is to compose an e-learning process reusing learning components or activities, at different granularity levels (Rosenberg, 2001).

In this chapter we describe a visual language-based approach aimed at supporting the definition of e-learning processes assembling predefined didactic contents. The learning contents can be broken down and structured into a hierarchy from smaller, lower order blocks of material to higher, more complicated levels of learning. In particular, we have identified three different granularity levels referring to the size of knowledge contents. The use and assembling of these knowledge components provides the instruction designer with a modular paradigm to create distance courses, which resembles software development processes based on visual languages (Ferrucci et al., 2002; OMG Group, 1993). Hence, it has been defined a hierarchy of three visual languages to be employed during the different phases of the distance courses design process. Based on these languages we have constructed the System for E-Learning Activity MANagement (SEAMAN) to provide automated design support. The system and the underlying approach are particularly suitable for learning methodologies centred on didactic materials and assessment rules.

The first visual language we propose extends the activity diagrams of UML (unified modelling language) (OMG Group, 1993) to enable the specification of didactic contents, assessment activities, and their relationships. For that reason such diagrams are named learning activity diagrams (LAD). They provide an explicit way to represent complex relationships between structural and behavioural e-learning activities. Any activity specified in a LAD sentence can be further refined by reusing previously defined e-learning activities or using a visual sentence belonging to either the self-consistent learning object (SCLO) language or the test maker language (TML). SCLO