Chapter XI

Requirements Engineering for Courseware Development

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Abstract

Technology-enabled learning using the Web and the computer and courseware, in particular, is becoming more and more important as an addition, extension, or replacement of traditional further education measures. This chapter introduces the challenges and possible solutions for requirements engineering (RE) in courseware development projects. First the state-of-the-art in courseware requirements engineering is analyzed and confronted with the most important challenges. Then the IntView methodology is described as one solution for these challenges. The main features of IntView RE are: support of all roles from all views on courseware RE; focus on the audience supported by active involvement of audience representatives in all activities; comprehensive analysis of the sociotechnical environment of the audience and the courseware as well as of the courseware learning context; coverage of all software RE activities; and development of an explicit requirements specification documentation.
Courseware: A Typical Sociotechnical System

Continuing professional education and life-long learning are both vital in order to maximize competitiveness, introduce innovative technologies, and prepare for new challenges in all branches of industries. Traditional strategies for education and training such as seminars are not able to fulfill the growing demand for further education in a topical and efficient way. Therefore technology-enabled learning using the Web and the computer and courseware, in particular, is becoming more and more important as an extension or a replacement of traditional further education (Levis 2002; Ochs & Pfahl, 2002). We denote as courseware any instructional system delivering content or assignments via computers in order to support learners as well as teachers in technical and instructional ways. In other words, from the users' point of view, courseware may be seen as educational material (content and instructional guidelines) that is distributed via the Web for training purposes. From the developers' point of view, courseware can be perceived as a collection of multimedia documents interrelated by means of (perhaps restricting) navigational structures, which is supplemented with community functionalities.

Courseware is usually not developed by software companies but by content experts such as publishing companies, universities, or companies that want to use the courseware for their internal further education. This is mainly due to the fact that courseware is perceived as an instructional product, although it is definitely software. Courseware is a special kind of software, adding an instructional dimension to the content, functional, non-functional, and user interface dimensions of traditional software. Its main goal is to support the learners in achieving their learning objectives in an effective and efficient way. The software and user interface features of courseware are essential in achieving this goal but also have to fit into and support the overall instructional strategy of the courseware. Furthermore courseware is very often integrated into a larger educational program (that is, a curriculum). The courseware is used to achieve only a few of the learning objectives of the program. The other objectives are achieved by seminars, talks, workshops, virtual communities, and so forth.

Thus, courseware is one particularly complex example for a sociotechnical system that requires equal support for user needs and technological innovations. Requirements engineering processes for such systems typically build on a user- and usage-centered process (for example, Constantine & Lockwood, 1999). They start from task and user profiles and gradually develop an understanding of the domain, of the technological options, and of the interactions between users and software (for example, the TORE approach (Paech & Kohler, 2003)). The challenge for courseware development is that in addition to the procurers, users, domain experts, and software developers, there are also instructional experts as stakeholders. Thus, two levels of tasks have to be reflected: on the one hand the learning task (interest of the instructional experts) and on the other hand the working task, whose performance should be supported through the course (interest of the procurers, users, and domain experts). Both influence the functionality, quality, content, and presentation of the courseware. In addition they are embodied in an instructional strategy that drives the courseware.

Subband Coding of Signals