

OR-World – Using Learning Objects in a Hypermedia Learning Environment

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Abstract We live and learn in a world filled with information. To prepare students and employees for the competition and globalization of tomorrow's world, universities and enterprises are faced with an increasing need of up-to-date information and learning material at reasonable costs. Because of the fast changing requirements of professionals, lifelong learning is required in practically all areas, especially those related to information technologies. The objective of the project OR-World is to respond to today's increased education need and develop a World Wide Web based framework for sharing high-quality learning material between universities, educational institutes, self-learners, and interested companies, in various countries.

Project Description

Although the World Wide Web has experienced an unprecedented growth during the last five years, its potentials are by far not used optimally yet. In the world-wide digital network, teachers and learners do not have to be physically present at same place and time in order to be in contact and interact. The availability of electronic communication and network-structured, hypermedia content opens up completely new ways of higher education in universities and education centers. The project OR-World has been proposed in the European 5th Framework Programme and will be funded by the European Community (EC). The goal of the project OR-World is to achieve innovations in areas such as hierarchic structuring of content modules and flexible thematic combination (metastructure) of content modules, use of case studies within a learning network, and distributed self assessment and grading. The project consortium consists of seven partners, four universities and three companies.

A central goal of the project is the development of a user-friendly, World Wide Web based framework to generate hypermedia content for distributed, collaborative learning. The framework can be used to create learning environments that enable education and training centers to share reusable learning objects and maintain integrated learning services. With the term "learning objects" we refer to any digital or non-digital entity, which can be used, re-used or referenced during any learning activity, according to IEEE-Standards (IEEE 1999). An important issue when dealing with learning objects is granularity. In the project, we will work on several granularity levels. This means that the general framework will support the following building blocks to be used in constructing flexible, reusable learning environments:

- a *media element*, refers to text, animation, simulation, video or audio sequence,
- a *learning element* comprises one or more media elements,
- a *content module* consists of one or more learning objects, and is understood as a node in the hypermedia network,
- a *thematic metastructure* defines guidelines how to use content modules to build thematic structures relevant for a specific study goal; such a structure can be put together in individual ways, thus adapting to different combinations and profiles.

Thus, a teacher can set up his or her own content modules and offer them to others via the Internet. We suggest to build a consortium of trusted members, who want to work together, thus extending their own learning materials offering in a meaningful way. Above these content modules, various thematic networks can be built, which represent larger learning units, like a course or guided tour. The reusability will make it possible to create

a “web of networks” using the same building blocks but setting different viewpoints and preferences. The objects at each hierarchy level are tagged with metadata to facilitate their flexible use in different contexts. The framework will be usable in a multilingual environment. It will support networked communication between tutors and learners outside the classroom. The framework will provide a general structured environment to input any (structured or semi-structured) contents. A certain level of structuring of the learning material is a prerequisite for applying the framework. Teachers will be able to use the framework in creating their own specific learning environments where they can combine their own learning objects with those generated by others. Thus, there will be a metastructure above the hyperspace of learning objects allowing multiple views on a certain subject area.

Project Objectives

Within the project, use of the framework will be demonstrated with contents of the subject area Operations Research/Management Science (OR/MS). However, the framework itself will be content-independent and usable to teach most content areas. It will be suited for using by a consortium of teachers (or learning institutes) who are willing to share material and are convinced about the quality of all partners, thus allowing a flexible extension scheme by each member without bureaucracy. Furthermore, if several universities and companies adopt the framework and methodology, they will be able to share a learning environment and strengthen their co-operation, thus providing high-quality teaching and learning materials. The project OR-World itself gives an example of sharing a learning environment, it involves four universities from three different countries, all offering courses in joint central subject areas.

Case studies are a well-known interactive teaching and learning method, not only in business and management, but also in various other fields, like engineering, law, agriculture, etc. (Erskine 98). OR-World will offer a concept and toolset to facilitate the use of cases in a virtual, distributed learning and teaching environment. Over one hundred years, the case method has proven to be successful; we aim to bring the method over to the environment of computer-supported distance learning. However, we do not believe that cases can be used totally without personal communication between learners and instructors. Thus, a goal of the project is to develop new guidelines and tools in order to achieve an optimal organizational form for the use of case study teaching within the virtual network.

Another objective of the project is to carry out a large-scale experiment to promote European integration and to develop a European identity for the subject. Thus the participating four universities and three companies will work closely together, each providing specific individual strengths either in the area of emerging digital technologies or content production and structuring. The learning objects will allow new schemes for virtual collaborative learning to be tested in cooperative joint university-industry education frameworks.

Because the initial standard Web markup language HTML does not support efficient structuring, retrieval, and linking among very large amounts of documents, more general technologies, such as the extensible markup language XML and XSL, are emerging. XML responds to a strong need to separate content of a document (text, graphics, video etc.) from its logical structure (content table) and representation (formatting on the screen or printer). The project OR-World will use XML on each granularity level to describe the elements and hierarchic structure of the learning hyperspace. The IEEE Working Group P1484.12: *Learning Objects Metadata Working Group*, is currently working on standards for describing learning objects in terms of metadata. According to the working group, “This standard will specify the syntax and semantics of Learning Object Metadata, defined as the attributes required to fully/adequately describe a Learning Object. Learning Objects are defined here as any entity, digital or non-digital, which can be used, re-used or referenced during technology supported learning. Examples of technology supported learning include computer-based training systems, interactive learning environments, intelligent computer-aided instruction. The proposed metadata scheme will be used in the OR-World project to facilitate the re-use of existing material.

To demonstrate and test the power of the OR-World concept, we will implement some contents from the interdisciplinary area Operations Research/Management Science. The exemplary implementation will comprise the whole functional spectrum including multilingual content components, distributed learning, self assessment, and grading.

References

- Erskine (1998)*: Erskine, Leenders, Maufette-Leenders: Teaching with cases. Richard Ivey School of Business, Univ. of Western Ontario, 1998.
- IEEE (1999)*: Learning Objects Metadata Working Group, <http://ltsc.ieee.org/wg12/index.html>.