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ABSTRACT

This paper presents the design of a project-based study environment on the World Wide Web based upon the e-study concept, i.e., studying by means of Internet technologies. The first section discusses the e-study concept, including Interactive Study Environments (ISE), Interactive Study Systems, and online Study Services. Design guidelines for a project-based study environment on the Web are presented in the second section, including three phases (prepare, guide, and evaluate education). The following generic guidelines related to all three phases are summarized: users need to be able to up- and download information; users have to be able to communicate with each other; users need appropriate performance support; and the instructor needs to be able to perform administrative tasks. Phase-specific guidelines are also addressed. ComMedia, an example of a project-based ISE developed at Twente University (Netherlands), is described in the third section. Two figures illustrate the e-study concept and the "Cabinet" (the online knowledge base) in ComMedia. (DLS)

Design of a Project-based Study Environment on the World Wide Web

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Abstract:
Curricula at the higher and university education level will become more and more flexible and interactive of nature. Problem-based or project-based education will become keywords in such curricula. In this paper we present the design of a project-based study environment on the web. The basis for this design is the e-study concept, studying by means of the Internet. We describe central design guidelines and present ComMedia as an example of such an environment.

Introduction

Curricula at the higher and university education level will become more and more flexible and interactive of nature. Future education will become embedded into the rapidly forthcoming global information society. Information and communication technologies (ICT) enable the students all over Europe to put individual curricula together based on available international flexible and interactive courses. Teachers will be able to guide students in a flexible and interactive way. In the project FLINT (de Vries, 1997) we focussed on the design of study environments in order to enable students and teachers to work and study in a flexible and interactive way. We coined the concept e-study (de Vries, 1998), this concept stands for studying by means of Internet technologies. In this paper we describe some of the results of the project FLINT. The question we want to answer here is how to design project-based study environments on the web. Firstly, we outline the concept e-study. Secondly, we describe key design guidelines for such environments. Thirdly, we describe ComMedia as an example of a project-based study environment.

The E-study Concept

'E-study' concept stands for studying by means of the Internet. On the Internet, teachers are expected to prepare study tasks. While learners perform these tasks the teachers guide the study processes, after which teachers are expected to evaluate the study processes and results. Software tools are needed for preparing study tasks, performing study tasks, guiding the study process and evaluating study results and processes.

Educational Institutions will be able to disseminate certificated courses. Certificated means that these courses are rated against European educational standards. In addition to these courses, a variety of organisations can offer (online) Study Services. For instance, publishers can provide for instructional multimedia information objects (IMIO's). Such objects are expected to become the electronic counterparts of for instance chapters from study books. Figure 1 illustrates the E-study concept.

We use the concepts Interactive Study Environments, Interactive Study Systems and online Study Services to describe the E-study concept (Vries, 1997, Vries & Vogel, 1997). Basically, we see an Interactive Study System (ISS) as a software system consisting of study task forms (electronic forms that provide learners with information and/or tools necessary in order to attain the study goals), study tools (software tools that are particularly designed to enhance individual or group-based study processes), information resources (the multimedia information content matter), and if needed additional materials (information and/or tools that support study processes but which are not offered in an electronic way). The main goal of an ISS is to enable an interactive study process between a user of the system and other users and/or between the user(s) and educational resources. It is important that an ISS can be very small and simple. An example of a simple ISS is an individual study task, a webpage providing learners with information about a specific task, relevant links to information resources, and enabling e-mail contact with the teacher. However, an ISS can also refer to a complete two-month course involving 100 learners, in which course specifically designed study tools and multimedia information content are applied.

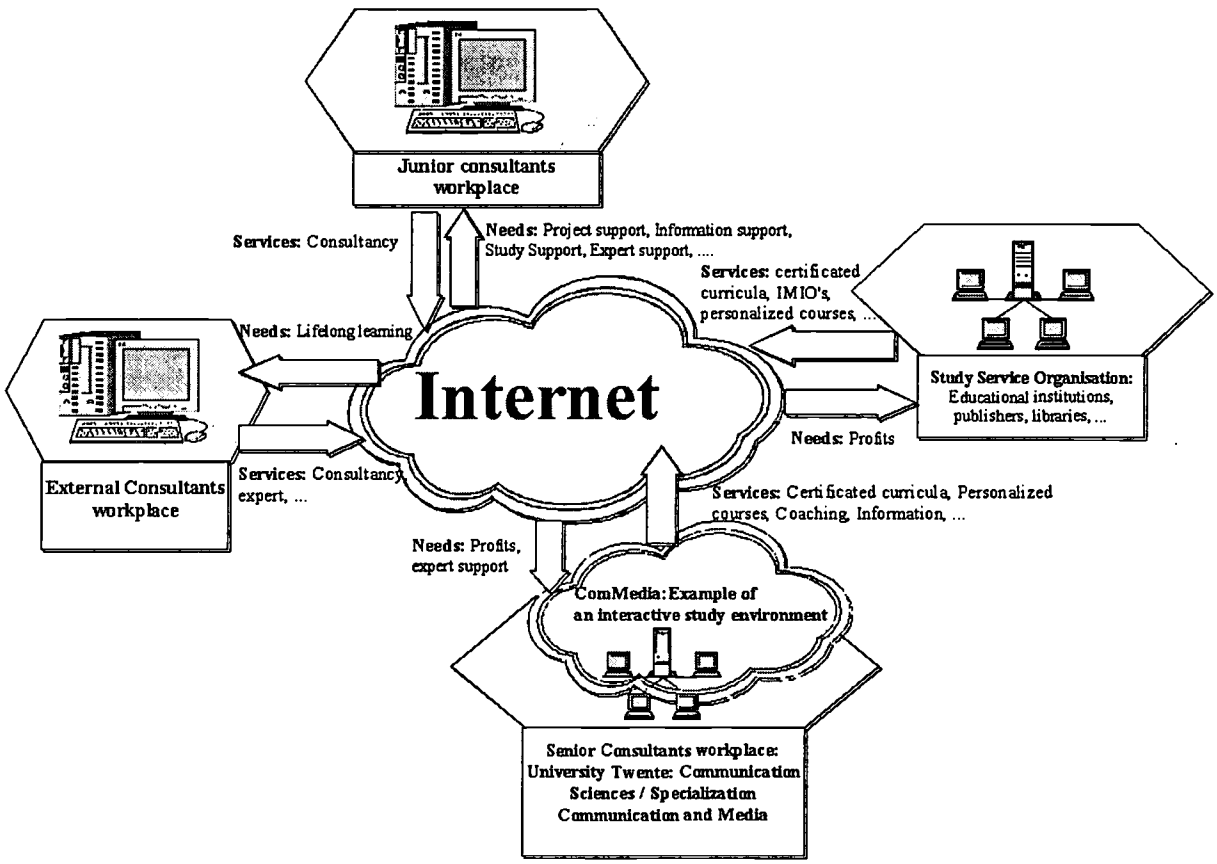

Figure 1: The E-study Concept

To give the needed support to teachers, there is a need for Interactive Study Environments (ISE's). An ISE is a software system for the preparation, application, and evaluation of ISS's. Such an environment consists of the following basic components: preparation, application, and evaluation tools and Interactive Study System Components. An electronic library and an electronic café can for instance extend it. Preparation tools are for instance information editors, 'learners' prior knowledge analysis tools, and ISS-assembling tools. Application

tools are for instance learner guiding tools and schedule tools. Evaluation tools are for instance study process/results evaluation tools and Interactive Study System evaluation tools.
The main goal of an ISE is to improve the effectiveness, efficiency and attractiveness of the (re-) design, use and evaluation of ISS's. An environment in which the tools and methods are linked to the design and use processes should help teachers in the assembly process of ISS. We investigate if such an environment supporting a lifecycle of Interactive Study Systems (ISS) can be developed based on insights from the field of method engineering (Brinkkemper, 1996), more specifically situational method engineering (Harmsen, Brinkkemper, & Oei, 1994). In the E-study concept teachers and learners will be supported by means of a wide range of communication and information services, summarised in the concept online Study Services. For instance, educational publishers as 'content owners' may act as a Study Service Provider. They provide teachers and learners, who apply study books of the involved Educational Publisher with services linked to the study books. Examples of such linked services are for instance: the so-called Instructional Multimedia Information Object's, examples of study tasks, updated instructional multimedia information content, updated links to relevant websites, new study tools, and shared magazines filled with results of various but related study projects. In the E-study concept ISS's, ISE's and study services are interrelated.
In this paper we look at project-based study environments is a specific type of an ISE. Study projects can be seen as a type of an ISS. We took a task-oriented approach in order to distinct guidelines for this type, because project education stands out for doing project tasks.

Design-Guidelines for a Project-based Study Environment on the Web

In Project-based education the tasks of the instructor and students are different from those in a regular school environment. The instructor is no longer the source of knowledge, but he facilitates and monitors learning. Learners face problems that they have to solve by working together in groups. An online project-based study environment has to facilitate such education. Project-based education can be described in three phases; prepare, guide and evaluate education (Dolné, 1977). The instructor will complete these three phases. In the 'guide phase' of the instructor the students complete three subphases: prepare, perform and evaluate the project.

The design-guidelines we mention here are based on the tasks of the users. We first make a distinction between generic and phase specific guidelines. Generic guidelines are related to all three phases, while phase specific guidelines only refer to one phase.
We distinguish four generic guidelines. These refer to information exchange, communication, performance support, and administration. Both instructor and learners need information from each other. Learners need for instance the content matter that the instructor has prepared and the instructor has to give feedback on the reports that the learners have sent in. *The users have to be able to up- and download information, for instance documents, to and from the ISE.* An instructor has to give feedback to his learners, he has to motivate them and has to take care that they perform their tasks. A learner has to meet and discuss with groupmembers and asks the instructor questions. *The users have to be to communicate with each other in an ISE.* The project members are not experienced in carrying out projects and the specific project assignments. They therefore need additional support in carrying out their tasks. *The users do need appropriate performance support by means of the ISE.* An important task of the instructor is to do his administration. During the whole project he performs activities to keep his administration up to date (e.g. enter learners for the project, make groups, write down marks etc.). *The instructor has to be able to perform his administration.*

The users have specific tasks in each phase, these are project preparation, project performing, and project evaluation.
In the phase 'Prepare Project-based education' the instructor prepares the project which he will offer in the second phase when the students begin with the project. In this first phase he has to make or collect all the documents the students need for the project and make them all accessible at the Environment on the Web. It is therefore very important that the instructor can upload documents to the Environment. This first task is very time consuming. It is therefore important to start a considerable time before phase two starts. Furthermore he organises the project in this first phase. He makes a schedule with due-dates for the assignments. In this way

he can stay in charge of the project. *The instructor has to be able to prepare the necessary project information and make this information accesible for students.*
In the second phase, where the instructor guides the study processes of the learners, he has to communicate quite a lot with the learners. In this phase he has to monitor his learners and give them feedback on their performance. Also he has to motivate them to execute their tasks and to discuss and meet with their group-members. Communication is the most important thing in project-based education. The instructor needs some means to communicate. During this phase he also has to do administrative work; enter learners- and group-information. When all is done the instructor marks the products of the learners. In this phase the instructor has to monitor for progress. Process control is an important task of the instructor in the second phase (Van der Veen, 1997). *The instructor has to be able to guide the study project processes.*
The learners begin with their project in the instructors second phase. The learners complete three phases: prepare, perform and evaluate the project. In the first (sub) phase the learners have to get acquainted with the project. The learner first has to make a group with other learners and then choose a subject. In project-based education a problem is the starting point of a project. Then they gather the information they need for the project (projectmanual, articles, schedule etc.). The students need to download these documents from the Environment. In Project-based education every student has a specific role in the group. And with every role there are some tasks the student has to fulfil. The last, but very important, task of this first phase is to make a workplan, where the group write preconditions and basic assumptions, a specification of the problem, method of approach, planning, division of tasks etc. In the second sub-phase the learners perform the project. They do research at the problem by searching (on the web) for literature on the subject, by interviewing experts and discuss with groupmembers. Communication is very important and takes place between groupmembers, between groups and between instructor and learners. The students need means to communicate with others. The final product is mostly a report about the problem. They have to be able to upload the report the Environment, so others (instructor or other groups) can evaluate it in the last phase. In the third sub-phase the learners have to evaluate. The learners evaluate their own product (self-evaluation) on content, structure, style used, and they reflect on their own process (what went wrong, why and how would they do it the next time). Furthermore they have to evaluate the products of other groups (peer-evaluation) and give their comments. The last task for learners is to fill in an evaluationform. The learners give their opinion about the project: what they think of the planning, the content, the assignment, the quality, tasks etc. *In a word, students have to be able to prepare, perform and to evaluate the study project.*
In the last phase of Project-based education the instructor has to execute his evaluation plan. In this plan he evaluates the planning, the process and the results of the project. Furthermore he analyses the evaluation forms that the learners have to fill in after they have finished the project, in order to further improve the quality of the courses. *The instructor has to be able to execute his evaluation plan.*

The guidelines mentioned are rather general of nature. Given a specific context of use, they have to be further specified. Grooters (1998) gives a more comprehensive overview of design-guidelines for an ISE for Project-based Education. In the next paragraph we describe ComMedia, a project-based Study environment, in which we meet the stated requirements.

ComMedia: A Project-based Study Environment on the Web

As stated, ComMedia is an example of an Interactive Study Environment. We took the metaphor of a company as the point of departure for designing ComMedia. Students are junior and teachers senior members. As a company, ComMedia has the following mission (de Vries, 1998):

- to offer consultation and design services to (non-) profit-companies facing corporate communication-media problems or interested in communication opportunities made possible by information and communication technology developments;
- to offer a usable information and communication platform to students and teachers to set up, look after, pass through, and evaluate study projects.

ComMedia is designed as a virtual learning 'Knowledge Company'. It is a knowledge company in the meaning of a business and a company, which primary tasks concern knowledge about the design and use of interactive media for corporate communication purposes. The company is a virtual one. It is an imaginary profit company and it exists online only. Last but not least, it is a typical learning company. Its major task is to enable 'junior

consultants' to become 'senior consultants'. We identify four major roles: administrator, senior consultants (teachers), junior consultants (students), external consultants (former students) and visitors. Tasks are carried out in (study-) projects. Each project team has a lot of freedom in completing the project, as long as they meet standard preconditions, set by teachers.

ComMedia is designed with a front and a back office. The front office is the reception for visitors. Intended visitors are mainly (non-) profit companies who have an interest in our work, but visitors can also be students who have an interest in the specialisation. Companies have the opportunity to ask for information, to use the 'online knowledge base' called the Cabinet, and to submit assignments, which students can carry out. Possible students have the opportunity to ask for information, and to use the Cabinet.

The back office is accessible for administrators, and senior, junior, and external consultants, so not for visitors. The back office 'functionality' for employees is dependent on their roles. The back office consists of four departments, the administration department, the education department, the research department, and the Cabinet. The administration department offers the functionality for managing the company and setting up courses and projects. The user role divides up the access to functionalities. A junior consultant, for instance, has only access to his or her own data. The education department offers the functionality for setting up, looking after, passing through, and evaluating projects. The research department is not active yet. The goal is to develop research facilities for research projects, for instance, computer-supported co-operative work tools for designing flow charts for websites, coaching facilities, etceteras. The Cabinet is the ComMedia repository in the sense of a mine of information. It is an online archive consisting of a wide variety of information genres, for instance, student reports, scientific articles, concept descriptions, methods descriptions, links to interesting information sources on the web (see Figure 3).

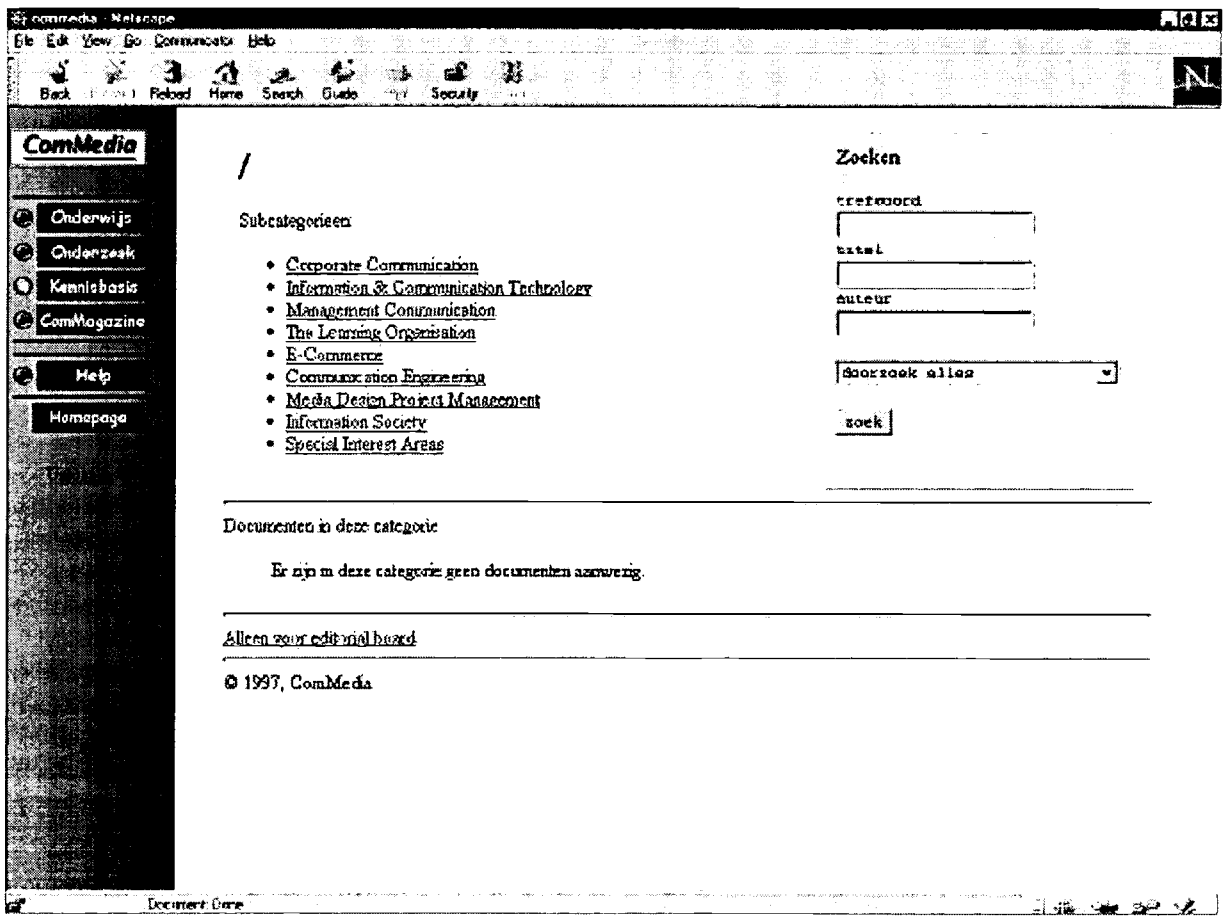

Figure 3: The Cabinet in ComMedia

The content concerns the domain knowledge of the specialisation Communication and Media, the design and use of interactive media for Corporate Communication. The Cabinet is being extended and updated continually. For that, we make use of an editorial board. The intention is that all study content materials developed by teachers and students are going to be stored in the Cabinet.
We consider ComMedia as an example of a project-based study environment. It offers teachers the opportunity to prepare, apply and evaluate study projects. Students have the opportunity to pass through these projects. In our courses, we still make use of lectures, practicals, assignments, and etceteras. We consider a study project in ComMedia as a type of an interactive study system. In such a project, students work together in an online project room. There are project information documents available, and they have applicable functionalities at their disposal, like a bulletin board, discussion platforms, and a logbook. They can also make use of an information resource, namely the Cabinet. In general, students can make use of offline information, like lecture materials.

Discussion

We think that our design approach, and as an example of this ComMedia embedded in the specialisation Communication and Media, offers opportunities for lifelong learners to acquire knowledge and/or skills in a flexible way.
ComMedia is going to be used in the second trimester of this year in a course of the study Communication sciences at the University of Twente. In the beginning it will be used in combination with classical lectures. An advantage of that is that the students who work with the environment can give their comments right away. These comments will be used as a formative evaluation, after which improvements will be made.
In theory the participants are able to perform all their tasks of project-based education in ComMedia. How it will be in practice is still a question. Because it is not implemented yet, there is no data about the possibilities of the users to perform their tasks. But the expectations for the future are high. No more classical lectures, students and instructors can do their work at home, even if home is at the other side of the world

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