

Moving studies to e-environments: a case study

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The rapid expansion of the Internet with the development of web-based technologies and services has had its impact on today's educational possibilities, enabling to move studies to e-environments. E-learning offers new possibilities to attain knowledge where time and distance are not the issue anymore, taking an advantage of the technologies and tools available. Also, traditional learning is moving towards the use of web-based environments and tools. There have been many different educational and learning support systems, some of them have failed, and some have been more or less successful. Hereby, we will provide an overview of the system, its importance and implementation in the study process with emphasis on the actual needs of ICT-teachers and students, as well as discuss the services and tools provided by e-EDU.

Keywords e-learning systems; study environments and information systems; web-based applications

1. Introduction

Over the years, universities have developed several different information systems, including systems that were supposed to support learning processes via providing materials, links and other information valuable during an educational course. However, the majority of universities' information systems concentrate on the management of study process as seen from the university's point of view, *i.e.* managing final assessment results and the subjects in general. The utmost disadvantage of such systems appears to be in the contribution to the actual study process, discarding all the bureaucracy concerned with teaching. If we want to apply today's technologies and ICT media in order to improve and enliven studies, to meet high academic standards and give a comprehensive view of each science, we need to strongly concentrate on the actual study process, on students – the target group to benefit of this.

The general practice among lecturers has been to use available tools or in case they do not meet one's real needs, develop their own systems for managing the courses. As a result, each lecturer had his/her own system for course management; usually applying spreadsheets for maintaining students' and their results and just copying the materials to a folder on a web server, or in case being more attracted to the net, building website for a course. This approach is rather lecturer-centric without providing any ICT-based support services for students. Evidently, for study purposes, one coherent system containing all the courses students have taken, is in everybody's best interest. Systems like WebCT, IBM Lotus Learning Management System, Moodle [1-3] and others have been developed to address these problems. However, these tools have grown into large and sophisticated systems being sometimes rather difficult to use and tend not to satisfy the actual needs of students and lecturers of a particular department, university, country, region or an educational system.

In further we discuss an online learning support service environment e-EDU [4], developed and maintained at the Department of Computer Engineering (DCE) at Tallinn University of Technology (TUT), its importance and implementation in the study process, as well as present some usage statistics for the last two years.

2. The e-EDU system

The e-EDU system proposes a new and localized approach as a service to enliven daily studies as well as offers means for distance learning in the study domain of information and communication technology (ICT) at TUT. The purpose is to provide services for both, students and lecturers during a study process,

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addressing problems like course registration and students' management, course materials, assignments, tests and results management, as well as providing several interactive hands-on tools. The system has been under development since 2002, following the software development process proposed in [5], based on the kernel developed at DCE [6]. The modular architecture of e-EDU enables to include a wide range of modules as appropriate. The e-EDU has been elaborated over the years according to the experience of the lecturers of TUT as well as technological improvements in IT and new trends in teaching.

Whereas e-EDU is a web-based system, it can be used everywhere, regardless of the underlying system, as long as the user has a connection to the Internet and a web browser. We have strictly followed the principle that e-EDU should be accessible with at least three common web browsers and there should be no need to install additional software or plug-ins (e.g. ActiveX controls) by the end-user. The service should be workable as is with as minimal dependence as possible from the platform used.

3. Applying e-EDU in study process

Today, e-EDU is being actively applied as the primary learning environment in 10 different hardware and software related subjects taught by DCE for students of ICT. Currently we have more than 2500 students registered in the system. The system itself is targeted to three user groups, each of them having a different interface view (GUI). The GUI for students has been implemented as a stand-alone web portal edu.pld.ttu.ee; the GUI for lecturers and administrators has been established as a part of the intranet solution of DCE. In further, we will focus only on the students' view, as it is evident that for proper functioning of e-EDU, lecturers have to have means for system management, e.g. tasks and student management. Additionally, lecturers are equipped with tools for course statistics and generating various reports.

3.1 The students' view

Traditionally, students visit lectures, make notes, have some practical tasks to perform and finally take the examination. The knowledge gained from the course can mainly be represented by the materials distributed by lecturers and the notes made by students. This traditional approach is also exploited by e-EDU in terms of ICT - everything is made accessible in an online environment, accompanied by different tools necessary in the study process.

In order to access e-EDU, students are required to register for a course, during which they have to make choices according to their personal preferences – selection of the lecturers, course schedule and the study group in which they will take part of the studies. This allows the academic personnel to know the actual distribution of students (may differ a lot from the prognosis made by the university) for a particular course. User authentication is made very easy - students can access e-EDU with the username and password given by the university for accessing the computers and university's intranet resources. Therefore, there is no need to maintain yet another password. After successful subscription, a menu with a subject's name appears, through which a student can access all the resources and services concerned with that subject. Registered users have a full access to the services provided by e-EDU:

- *Personal assignments*. Each student gets a personal assignment through tasks subsystem. Tasks can have preconditions, e.g. in order to take Task2, student has to have Task1 in status “performed”. Setting prerequisites will enforce the correct order of tasks' accomplishment and disables students to perform those, which require knowledge from previous ones. At the same time, it acts as an external motivator, as the length of the term is limited (at TUT it is 16 weeks) and each assignment has its deadline. The tasks subsystem also assures an equal allotment of different variants over a set of students.
- *Personal progress* at the course, compared to other students; this approach enables to motivate “lazy” students to improve their efforts.
- *Study materials*; the materials are grouped by study modalities: i.e. general, lecture, practice, seminar, etc., which establishes a clear distinction over them.
- *Online tests*; students can take tests online, which also can be evaluated automatically.
- *Course news*; announcements set up by tutors.

- *e-Check-in* for a lesson; through the e-check-in service students can signal that they were participating the lesson, for example in case of distance learning in online form, but as well as stationary studies in a computer-equipped classrooms.
- *Deadline remainder* for assignments; a notification e-mail will be sent to a student.
- *Course communication board and forums*; students can raise discussions and contribute in course and general forums.
- *Course resource-set* as a collection of additional links.
- *Course contacts*; lecturers' contacts and office hours.
- *Course descriptions* as extended subject information cards with schedules.
- *Personal calendar* management; assignments' deadlines appear into calendar automatically.
- *RSS (and Atom) feeds subscriptions* for course news, deadlines and new materials notification.
- *Personal profile* management.
- *Online registering* to exams, consultations, and laboratory works.
- *Course-specific services*, such as hands-on simulator tools.

Additional services, such as direct access to university's mailbox, account and quota information on university's server resources, are also provided through e-EDU (Fig.1), with the goal to make the study process as enjoyable and comfortable as possible using ICT.

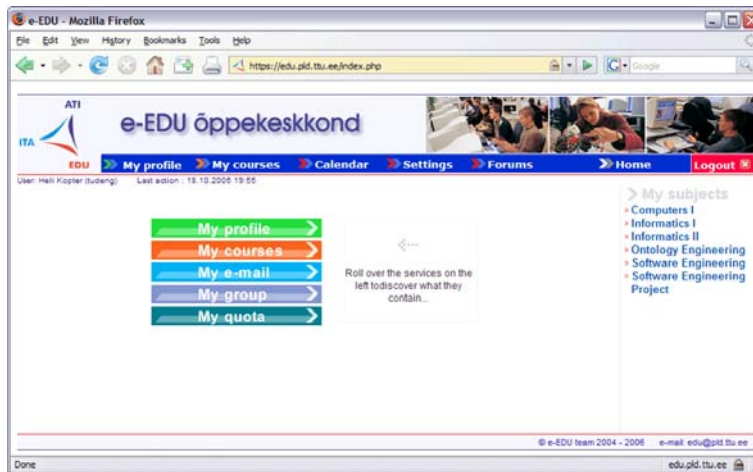


Fig.1 Online learning support service environment e-EDU; main page for services selection.

In order to study at home or to prepare for the next lab, it is essential for students to be able to access the lecture materials as well as the dynamic knowledge represented during the course. The latter can be achieved by using interactive game-like simulators, where students can learn by doing and sense how their actions affect the simulated system or its parts [7]. The incorporation of hands-on simulator tools in e-EDU enables to enrich traditional ways of studying with the means of today's ICT means and by the concept of e-learning. In further, by involving already available tools for special SOC design in digital systems test-related topics as living pictures [8, 9], the study process becomes even more valuable through better understanding of the problem domain. However, this requires special interfaces to be used to ensure correct communication between e-EDU and the simulator tools.

3.2 Main advantages of employing the e-EDU

The implementation and exploitation of e-EDU online learning support service environment, as an intelligent use of ICT towards e-supported courses and distance learning, has greatly affected the study process, in comparison to the period before e-EDU. It has been beneficial for both parties - the students and the lecturers. Firstly, the courses are now on the Internet, which leads to an ubiquitous access to the

course for students and lecturers. Secondly, everything a student needs is now gathered into one coherent and transparent environment, where everything is reproducible. For instance, a student gets an assignment on a paper and loses it, which happens quite a lot actually. However, with e-EDU, all the assignments are online, each student has a personal variant and can print it out, copy or download it whenever needed. This also applies to course materials. Thirdly, the communication tools (news and forums) of e-EDU provide a convenient environment to be always informed and discuss problems with others. Fourthly, as everything is online, students can get feedback and easily keep track on their progress and results (accompanied with comments from tutors) over the subjects.

In terms of the benefits for a tutor, e-EDU has greatly reduced the workload via providing several management tools. Therefore, lecturers are able to focus more on other areas of the course, which results in course improvement. Moreover, through student profiles, they can get a direct contact with a student.

Finally, in comparison to different e-learning environments [1-3], e-EDU has a native language interface, which has a clear advantage over other non-native language environments, as not all of the students have studied English as their first or second foreign language.

3.3 Usage statistics for e-EDU

In this chapter we discuss some of the usage statistics for e-EDU over the time period of 5 study semesters, from fall 2004 until fall 2006. It should be noted that fall'2006 covers only the first half of the semester and exceptionally lacks one of the courses, which has had approximately 100 students every autumn. During the aforementioned period, more than 58 500 user accesses were registered. Based on this data, involving also information available about the courses, we analysed how students were making use of e-EDU through different time dimensions as well as different access trends. The results of the workload analyses are shown in Table 1.

Table 1 Workload analysis for lecturers using e-EDU for fall 2004 – fall 2006.

Semester	No. of tutors	No. of students	No. of subjects	AVG students per tutor	Tutors per subject	Tasks assigned	AVG tasks per student	AVG tasks managed by a tutor
F'04	11	793	7	72	1.6	1513	1.9	137.5
S'05	6	304	2	51	3.0	1784	5.9	297.3
F'05	11	861	6	78	1.8	2515	2.9	228.6
S'06	5	201	2	40	2.5	1634	8.1	326.8
F'06*	8	384	6	48	1.3	549	1.4	68.6

* only the 1st half of a semester

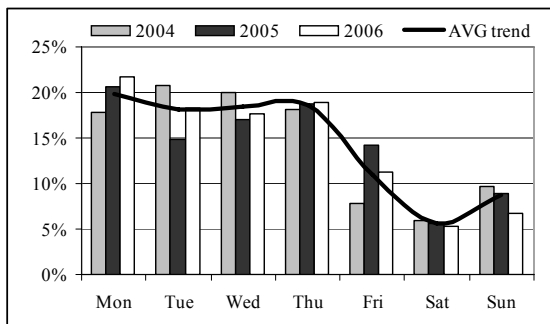


Fig. 2 Access rate for e-EDU over weekdays

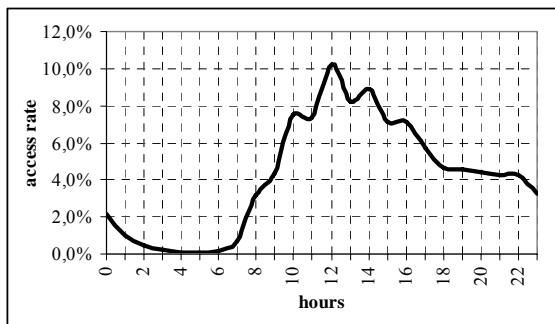


Fig. 3 Average access rate for 24-hours (fall'04-fall'06)

The access rate analysis for weekdays (Fig.2) clearly shows that students are actively using e-EDU at the beginning of the week, or close to it (note the climb from Sat to Sun). The 24-hour graph (Fig.3) depicts a distinct relation between the start of lessons (note the peaks at 10, 12, 14 and 16) and access rate, which indicates the active use of e-EDU. However, the lessons are usually over after 17:30. As we can see, the study process continues until late in the night, and even some single accesses throughout the night were discovered.

We also analysed the rate of daily accesses over students for the abovementioned period of time and found that averagely 12% of students made at least one visit to e-EDU daily, 8% of them visiting it more than once a day. The average number of accesses to e-EDU per day was 85.1, with low access rate during summertime (mid-June until mid-August) and with the maximum number of access a day as 349 visits (fall'2005). The user, who had visited e-EDU the most, made averagely 1.6 visits a day.

Conclusions

The online learning support service environment e-EDU provides a new and localized approach to enliven daily studies at the university as well as provides means for distance and e-learning. It assembles into one coherent environment all the essential services a student needs for studying: materials, lecture notes, additional resources, course news, tasks to accomplish, results, interactive learning and proofing tools. The e-EDU also lessens the workload of teachers via means for course management among with other tools.

Taking and advantage of today's technologies and utilizing web-based environments, not only enables us to improve the learning process but also raises the interest towards studies and brings students closer to the problematic areas of IT. Implementing e-learning environments for traditional studies as well as for distance learning is becoming a common practice. Therefore, we are continuing to develop e-EDU to enable to keep the courses up to date and offer students contemporary ways of learning.

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