e-learning@alma-mater.de - Net-based distance education in the traditional university

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Key words: Distance Education, Tele-Teaching, Virtual University

Abstract: E-learning will not inevitably cause a revolution of the traditional university. On the contrary, it is not yet clear whether multimedia and network technology will find its place in the university to benefit or profit the students. We discuss various methods and techniques (including Learning Management Systems, synchronous tele-teaching and Web-based seminars) and propose best practices, which can succeed under the specific conditions of a traditional university.

1. INTRODUCTION

Not that long ago Encarnacao et al (1999) predicted the end of the on-campus university as we know it by the year 2005. They maintained that E-learning will become the common form of education, educational providers will operate world-wide and every university will have to fight hard for its position in the global market. Only a few élitist universities will maintain classrooms in which excellent teachers still meet their students face-to-face.

Whether this scenario is a promise or a threat has been discussed passionately since the paper was published. A lot of activity has been generated. Federal and state programs almost everywhere have fostered

The original version of this chapter was revised: The copyright line was incorrect. This has been corrected. The Erratum to this chapter is available at DOI: 10.1007/978-0-387-35663-1_34

T. J. van Weert et al. (eds.), *Informatics and the Digital Society*

hundreds of ambitious projects in Germany and Switzerland under the heading of "Virtual Universities XY".

However, in the Europe of the year 2002 the traditional university is still very much alive, unwilling to give up its place to its virtual counterpart. There are strong reasons why this will not change in the next decade. First, distance education is not desired as the general model of studying, either by the universities, or by prospective students. The drop-off rate is significantly higher than in traditional studying, and many people still appreciate campus-life as an important phase of personal development. Secondly, even if universities would like to develop net-based distance programmes on a larger scale, they can't afford it. For the production of just two masters programmes in the *Virtual University of Applied Sciences* over 20M Euro were needed. The *Virtual Campus Switzerland* (a federal program, not an institution) spent more than 100,000 Euro in developing a course of 3 ECTS credits. These figures don't include the costs of actually running the courses.

Clearly, a virtual revolution of the alma mater is not in sight. Rather, the question is how universities can take advantage of "new media" technology. Indeed, we face the great danger that most of the results from good projects are not adopted into everyday activity and that the great political, scientific and financial effort may not give rise to any substantial new possibilities for students.

Through our involvement in several projects we have gained a lot of experience with different forms of web and multimedia based education (Kandzia and Ottmann 2001). In this paper their usefulness for a traditional university will be discussed. In particular, we stress the following criteria. First of all, an e-learning method or technique must produce added-value for teachers or students. In most cases this will be more time and space flexibility without a loss of learning success, but it may be a gain of pedagogical quality as well.

Further, if this scenario is to be used in the everyday-life of a traditional university, it has to fit smoothly into normal university work, tools which are easy-to-use have to be available, and it should not be too costly.

2. E-LEARNING OPTIONS

2.1 Learning Management Systems (LMS)

A Learning Management System (LMS) provides the basic functions needed for composition and delivery of any web-based educational offering administration of users and courses, composition and delivery of content, communication, assessment and grading. As a central service an LMS must

be installed and run by a central department within the university. Leaving this task to single small projects is extremely inefficient especially if different projects run their courses on different platforms that are not interoperable (a situation found in many universities).

In most cases it is unreasonable for a university to develop its own LMS. There are many commercial solutions on the market, some of them open-source, and even when their drawbacks are taken into account, universities will find it difficult to provide a better alternative and support it over many years.

2.2 Synchronous Tele-teaching

In synchronous scenarios a live lecture or seminar is transmitted to one or more participants using video, audio, and a shared whiteboard. In a distributed seminar the teacher's work is much more involved than in one classroom alone: he/she has to motivate group work and participation to compensate for the loss of face-to-face communication, e.g. by common presentations of two students from different locations. Students also require special training to use tools like a shared whiteboard. However, those skills are very useful and appreciated by the students.

The main drawback of this scenario is that it only yields satisfactory results if the teachers of all connected sites work together very closely, since co-ordination of timetables, curricula, and credits is essential. Furthermore, special rooms with data projectors and advanced input devices like graphics tablets as well as high-speed connections are needed - we use MPEG2-Hardware and a virtual LAN over ATM. There should also be technical support. In home learning variants video quality is still poor. All in all, synchronous tele-teaching does not satisfy the goals of time and space flexibility. Although in certain cases with the right partners and thorough planning it may yield a convincing performance it cannot be generally recommended.

2.3 Web-based Seminars

In contrast to seminars based on a form of videoconferencing, web-based seminars mainly rely on textual communication - newsgroups, mail and chat. Material in normal web-formats is shared easily. This scenario is cheap and, from a technical viewpoint, is easy to use. It is fully flexible in terms of time and can be used from the student's home PC. The organisational effort required on the university side is quite limited. Web-based seminars are found in the philological, political and social sciences - all of which involve working with texts. However, it would appear teachers of other disciplines

consider the pedagogical potential is too restricted. A very appealing didactical feature of web-based seminars is that professionals from outside the university can contact and work with students very easily.

2.4 Courseware Programming

With courseware (or WBT) programming we designate the exclusive authoring and design of web-based material. The end result may consist of simple HTML, but usually audio, images and animations are used. In high-end productions content exposition and the more interactive elements of self-tests, assessments or simulations are closely interleaved. Sometimes courses are adaptable to the learners' progress, for example, by making the material that is presented dependent on test results. Clearly the pedagogical potential is exciting and hence it is not surprising that the majority of "Virtual University" projects aim to produce courses of this type. However, the costs of courseware programming (in terms of time, manpower, and money) are extreme and are frequently underestimated, especially if the product goes beyond HTML and the didactic potential is really exploited (Rumble 2001). If a project is already over-stretched by producing static content, it will never be capable of giving appropriate student support or providing regular course updates. As a result, many ambitious university projects only produce a kind of digital textbook and never lead to courses students really profit from. The effort never achieves "pay back".

In special cases it may be reasonable and affordable to develop high-end WBT modules. Factors that justify such development include subject matter that is difficult to understand when taught in a traditional way, where the subject matter doesn't have to be revised frequently or where the WBT is used by large numbers of students. For example, when Java-Applets were used to visualise discrete cosine transformations the learning results were better than those from lectures. Problem-based-learning with a "virtual patient" in Medicine has also proved very successful.

In addition to the enormous time and money needed there is often a structural problem - courseware programming does not fit smoothly into the organisation of a (Humboldt) university. Universities mainly employ scientific staff whose motivation is research. They are not at all willing or skilled to be involved in web design and are too expensive to assign to routine technical work. The lack of appropriate personnel is often found in universities where little effort is put into developing elaborate courses on basic subjects. Rather, the pride of the alma mater is that well-known researchers contribute newest results in their teaching. In essence, content is much more important than presentation and the students accept this! There is

no evidence that this situation will change in the future and any "Virtual University" has to take it into account.

2.5 Lecture Recording

The considerations of the last section led to the development of a method appropriate to a university teacher's "production process". The basic idea of *Electronic Lecture Recording* is to record a regular live lecture in order to obtain versatile digital material at negligible additional cost (Kandzia and Maass 2001).

Lecture recording allows for a wide range of flexibility. *Formats* depend on the expected user behaviour. If easy access over a browser is important streaming formats like Real or Flash can be used. On the other hand, if the provision of functions such as effective "fast forward" and "fast backward" is necessary (since difficult content requires intensive searching, scrolling and jumping within the recording by the learner) a so-called random access format like AOF (Müller and Ottmann 2001) is needed. The *teacher's style* (and the *available equipment*) range from a low-end variant (using photo-snapshots of a chalk blackboard together with audio and video), through PowerPoint (using previously prepared slides on an electronic whiteboard), to a highly interactive and lively style (featuring hand-written annotations on a graphical input device during the lecture). If appropriate, the presentation may contain computer animations and simulations.

In any case all data streams like audio, video, whiteboard activity, and animations are recorded automatically. They are stored on a server, and can be replayed in a synchronised way immediately after the live event. The recordings serve as an excellent basis for online courses. To that aim the recording is edited and exercises, self-assessments, or other supplementary material are added. The enhanced recording can now be integrated into an LMS.

When post-processing a lecture recording one can adopt an arbitrary quality in a spectrum between pure recordings without any editing and, for example, a Macromedia-WBT that comprises only short patches of thoroughly edited recordings. The producer can choose the level. Starting with no, or very simple, post-processing in the beginning, a provider can concentrate on tutoring and setting up the course management. Up-to-date content and interesting material for the student is much more important for success than appealing design. As resources allow, or if the course is repeated, material may be reworked and enhanced.

The main advantages of lecture recording are its cost effectiveness and its rapidity (which provides for very up-to-date material and swift updating

when necessary). Also, due to the flexibility of lecture recording, the teacher's normal work is only slightly changed. The teacher is still preparing and holding lectures in their own personal style. He/she is not designing WBTs. Compared with a WBT the pedagogical potential of lecture recording may be restricted, but our experience is that students greatly appreciate lecture recordings providing they feature an interesting theme, a skilled teacher and appropriate support. The only serious drawback is that no fully convincing system for lecture recording is available on the market at present but several interesting products are emerging.

2.6 Tutored Assignments

In studies of the natural sciences, Computer Science, or Mathematics conceptualisation of a subject takes place during lectures. As a pedagogical counterpart tutored assignments are necessary and foster dialogue and construction. Characteristically, depending on the lecture course in which a student is enrolled, they will receive assignments to be solved alone or in a group of two or three persons. After a fixed amount of time, often a week, their solution is presented to a tutor for assessment. Usually tutors are advanced students responsible for ten to thirty students. The assessment is often part of the course accreditation. Afterwards the tutor discusses the solutions and other questions concerning the lecture with the student group.

This process, which is very typical in a university, can be transferred to web-based distance learning. In addition, such a system should include a report pool where all tutors of a course note general mistakes students have made and good solutions to the exercises. This tool also organises the important feedback between teacher and tutors. Statistical functions give information on whether the exercises have been too easy or too difficult. The statistical functions are much easier to implement and use in the virtual environment than in the paper-based setting. The students should have the possibility of comparing their personal marks with the average. Because exercise development is valuable work, a pool is needed in which all exercises are stored for reuse, together with appropriate metadata.

Surprisingly, although a lot of work has been undertaken on intelligent tutoring systems and adaptive exercises (Brusilovsky and Miller 2001), few systems have been designed to support the specific tasks and the communication features described above. In particularly the features of widespread commercially available LMS like Lotus Learning Space or WebCT are not sufficient. The FernUni Hagen (a German distance teaching university) was forced to optimize its paper and snail-mail based communication so it developed WebAssign and uses the system with thousands of students. Over thirty universities also use that open-source

software. WebAssign is specifically designed for creating exercises in programming (Brunsmann et al 1999).

Another popular system is also called WebAssign and was developed by the North Carolina State University. It has similar features to the FernUni Hagen WebAssign package. One drawback is that the integration into an overall LMS system (e.g. access to user data) has to be done by the adopting institution.

At present no system on the market fully supports all the functions we have described. However, we think that in the near future, appropriate solutions will be integrated in LMS (some of our ideas will be implemented in the LMS 'CLIX' produced by im-c).

Tutored assignments over the web fit very comfortably in the everyday work of the alma mater. This is a necessary and logical completion of a lecture recording with which it shares similar advantages. Bringing both principles together enables a university to transfer a major part of its teaching and learning in the virtual world.

3. CONCLUSION

How can a traditional university open a virtual branch? Clearly, some basic functions like an LMS or facilities for videoconferences have to be installed and supported as a central service. Departments have to decide to what extent they want to "go virtual" - maybe a full masters' program in distance learning mode, selected courses, simple enhancement of classroom-based work or organisational services like enrolment over the web. In all cases basic issues have to be resolved before any implementation begins:

- Who are the users of the planned product?
- Is it a convincing offer for them?
- Are enough appropriate partners supporting the project?
- Are the partners able to finance the project both short and long term?

Clearing up these issues early on seems fundamental but surprisingly few projects are able to give satisfactory answers.

When implementing the offering it is a good idea to use low-expenditure scenarios like lecture recording, tutored assignments, or web-based seminars, which are closely related to traditional university work. Trying to change pedagogical, technical and personnel issues at the same time is not an effective approach.

The alma mater will not be swept away. Most of us will be glad about that. The approach favoured above will not cause a revolution in universities. Some will regret this. However, the approach offers a realistic chance for

universities to build a programme of web-based distance courses with a scope broad enough to give students noticeably more flexibility, without losing the advantages of a campus-based education.

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