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E-Learning – Virtual universities in context

The demands made of employees are growing an at ever-faster rate, and so it is becoming increasingly important, especially for engineers, to keep abreast of the state of knowledge in the economy and the labour market. For people who work, this can be done only by means of e-learning that is independent of time and place. Learning content must be specially prepared for this purpose so that it can be published over the Internet. However, if this learning content is also published in other countries that are culturally different, it is extremely important to take those cultural differences into account and to bring about cultural acceptance. Virtual learning can be made effective through the principle of 'blended learning', a hybrid form of face-to-face and virtual learning.

Introduction

For some time it has been necessary for engineers to keep abreast of the latest developments in the economy and the labour market. Through e-learning programmes, virtual universities can provide a form of continuing education for people at work. What is particular to such courses is that they deliver online-based materials via the Internet independently of time and place.

High demand, and the profile of those who complete virtual university courses, demonstrate that these can deliver effective, high-quality teaching for engineers and others. For the first time, virtual universities can offer education and training to the many students located in remote areas where there are few institutions, thus providing a means of keeping in touch with higher education and training establishments through distance learning.

The great success of virtual courses lies in the ability to put together a wide variety of material, exploiting up-to-date scientific knowledge, applied research and national and international cooperation via the World Wide Web (see Figure 1). The way in which a course combines these inputs can make it stand out from other online-based courses.

Reasons for virtualisation

Future students will have increasing expectations of the use of new media in higher education. The current generation – sometimes known as the 'net generation' – comes with far more extensive experience of working with new media than any before. While earlier generations were accustomed to using television as a one-directional means of communication and adopted a consumer attitude towards that medium, the net generation is familiar with interactive communication processes from searching for information and knowledge on the Internet and from exchanging information and discussion via e-mail and chatrooms.

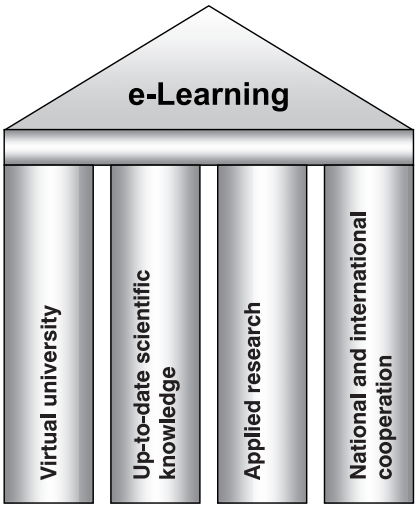
Because learning has ceased to be tied to a particular time and place, universities are increasingly competing with one another worldwide. It is obvious that education is no longer purely a local affair. Within six hours one can physically be in New York, and in South Africa within seconds by virtual means. Renowned universities such as Stanford, Berkeley, Harvard and Oxford are market leaders. This transparent international education market suggests that it is only the 'best' universities that may survive and that they may soon form an educational oligopoly. But this would mean universities which have so far concentrated on educating a numerically limited elite suddenly becoming mass providers of education for the entire world and thereby losing their brand identities. Every university, therefore, has to ask itself how the worldwide education market will develop in future. Markets need to be analysed, market shares defined and niches found. One of the questions that German universities need to ask themselves is how they intend to present their world-famous engineering courses in the American, Arab and African arenas. Unless a considerable proportion of the subject content is taught using the Internet, German education will no longer be able to maintain its international status and quality.

Another reason for virtual learning is to teach growing numbers of students, while maintaining the same standards and quality. There is also the constant question of how the quality of teaching can be raised and matched more closely to the individual needs of the student without increasing budgets and staffing. The new media can help appreciably to raise quality.

Lifelong learning demands that thought is given to a new relationship between work and education, since a strict division between successive phases of education, work and retirement no longer seems relevant under present-day conditions. The universities must adapt to new ways of teaching subject content and of supporting students, and must not only decide how to respond to changes in the life-plans and timescales of their students but also address the general question of whether new criteria need

to be applied to the notion of education as a whole.

Figure 1
Foundations of successful e-learning



Growth in Internet users

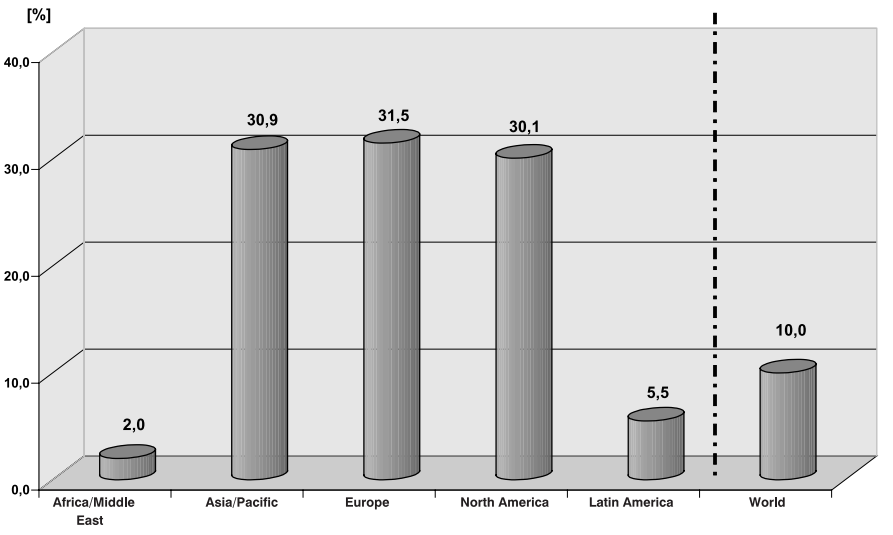
In a statistical report on the information society published in March 2003 by the Federal Ministry of Economic Affairs and Technology (BMWi), a forecast is given of the rate of growth in the number of Internet users between 2000 and 2004 (see Figure 3). A number of other things about growth in usage and the number of current ways of accessing the Internet can be said on the basis of this investigation. It suggests that only one citizen in every 10.42 worldwide has the chance of accessing the Internet. This means that while the Internet may offer a vast flood of information, only a small minority of the population can actually make use of it.

The investigation shows very clearly that strong growth can be expected in the Latin America and Africa regions in the coming years since this is where there is the greatest need to catch up and therefore the greatest potential for expansion (see Figure 2). However, if Internet technology and the associated virtual universities are to become established in these regions, it is important that these new technologies should gradually be integrated into the cultural and political environment. This growth in worldwide use of the Internet will make it possible for existing e-learning courses to include teaching input from countries outside Europe, leading, for example, to cooperation agreements for the exchange of teaching and research in engineering and applied information technology.

If the flood of data on the Internet is to be used efficiently, it is vital for the information required to be selected. The figures for the introduction of the Internet in Latin America, for example, suggest that Internet availability will grow faster than education and training courses teaching about Internet technology. This means that it will still be a considerable time before Internet technology can be used for e-learning and for teaching subjects via the Internet.

However, universities in underdeveloped countries are already setting about training skilled staff so that they can build on firm foundations in future developments.

Figure 2
Numbers of Internet users (by region)



Even in Europe, Internet technology is not yet so advanced that, for example, video on demand – general use of video streaming for teaching purposes – can be widely used in teaching. The great advantage in Europe, however, is the high level of Internet access, 40 % of all consumers having an Internet connection. This makes it possible to use the Internet for teaching on a smaller scale.

Technical arrangements and support

In order to provide students with access to course material from different locations, a virtual course needs a learning platform, based for example on the open-source Con-

Figure 3

Average annual growth in Internet use between 2000 and 2004

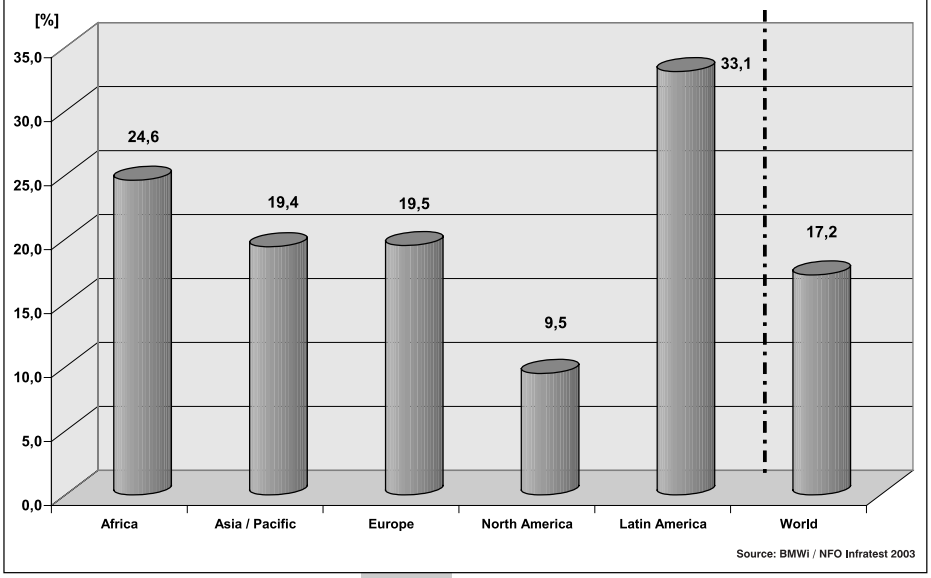
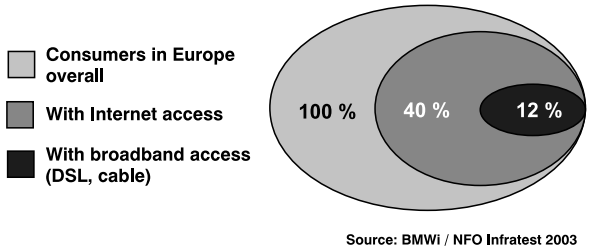


Figure 4

Broadband in Europe



tent management system 'ZOPE' (Z object publishing environment). A portal such as this permits access by students and teachers by use of a personal password, so that the material can be reached from any browser anywhere.

This method can ensure that staff in different locations are able to place learning materials directly on the learning platform from different locations, thereby remaining in touch with students. It is also possible for students to discuss problems direct with one another through the creation of chatrooms, or merely to exchange ideas and experiences. In addition to this form of working together through networking, students need to attend an average of two face-to-face sessions per semester to maintain personal contact with the teaching staff, and then to attend the university in person to sit the requisite final examinations.

The use of e-learning can be broken down into various aspects or subsidiary topics. These topics are teaching methodology, technology, content and arrangements. As Figure 5 shows, these topics add up to a whole range of potential factors which must be taken into account and which influence each other. The methodology used in teaching makes a particularly significant contribution to the success of student learning.

However, teachers and tutors working in e-learning have far greater, and more elaborate, opportunities for designing and structuring their teaching content. For example, complex procedures can be demonstrated using animated graphics, which are more easily remembered than statistical tables on paper. The use of soundfiles or complete film sequences as illustrations can also make it easier to take in learning content.

Electronic learning media do not always have an advantage over traditional paper-based media. It is not as easy to read from a screen as from a printed medium, which is one of the reasons why the paperless office has not yet proved workable. This means that textual content needs to be as concentrated as possible, and that other forms of presentation (animation and sounds) need to be employed instead. It is all too often forgotten that 'learning' implies intensive interaction with the subject-matter, and this means work. Unfortunately, graphics and animation can do nothing to alter that fact.

National and international cooperation

Through close collaboration between a number of universities it is possible to achieve expert coverage of different subjects from a range of locations. This form of collaboration is needed for the continual further development of courses that reflect the requirements of the economy, allows ongoing evaluation and guarantees high-quality learning content. The purpose and goal of such collaboration is to create focal points and profiles in the individual subjects and disciplines and to strengthen the profile and competitiveness of the universities, while providing a local source of knowledge transfer in the regions in question.

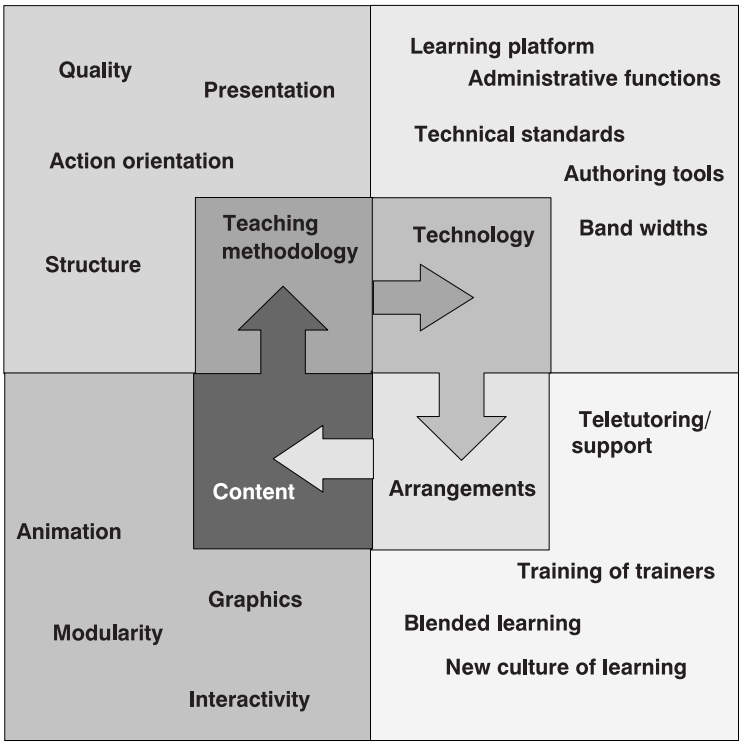
At international level, universities are giving increasing priority to the use of e-learning. The current political situation calls for greater cooperation with universities in states in Cen-

tral and Eastern Europe, both because these countries are in particular need of skilled workers and because students there are highly motivated to use international technology. Existing cooperation agreements have demonstrated that collaboration in research and teaching works very well, especially in the development and exchange of teaching content, confounding fears of cultural differences.

Experience of national and international cooperation between universities has shown that web-based collaboration is constantly improving in quality, with the result that teaching can continually be adjusted to the needs of students. In the future, distance collaboration will make cooperation more attractive, giving students the opportunity to learn for the future. Experience proves that education needs net-based collaboration.

Figure 5

Interrelationships between aspects of e-learning



Cultural acceptability

Previous investigations have repeatedly stressed the need to fit e-learning into the cultural fabrics of other nations. In the cultures of many countries, however, this process comes up against the boundaries of acceptability. If a culture is based on traditions handed down from forebears and if practices have a long heritage, present-day generations will find it very difficult to become attuned to 'man-machine-interaction' (MMI). In the case of some population groups in Latin America, Africa and Asia, for example, it is evident that cultural laws complicate the introduction of computer technology. It is, nonetheless, in these very regions that it is particularly important to build up individual learning and continuing education centres in major conurbations to give young people the chance of an education.

The younger population can be seen to have greater tolerance of information and communication technology since the media report every day on developments throughout the world, thereby arousing young people's interest. This is already the first step towards the adoption of technology.

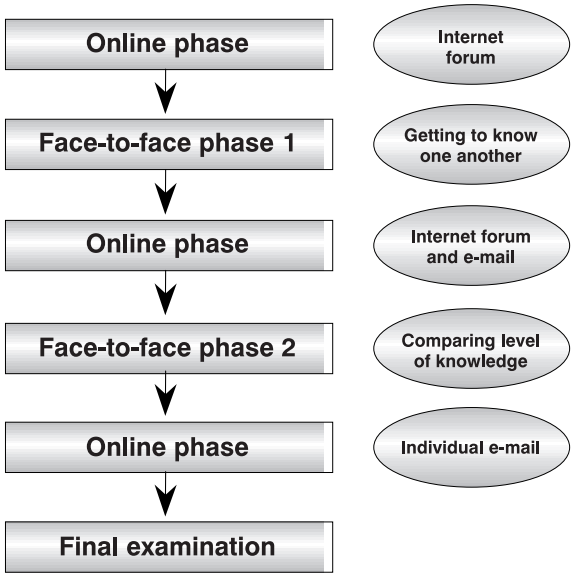
More student and teacher exchanges will allow students to gain an insight into the culture of the partner country and to overcome potential problems from the outset. Foreign students should live with German students in halls of residence so that cultural differences are forced into the background through the experience of shared living, while not being totally ignored. If cultural peculiarities are discussed in teaching, it will quickly be observed that e-learning as a method works across cultures. Special exchange programmes, supported by bursaries, can enable foreign students to pursue continuing education in Germany when they have finished their university education in their home countries.

Blended learning

In the information and communication society, lifelong learning is the route to success. The learning of the future will be guided by the knowledge actually required to perform day-to-day working tasks. The advantages of e-learning can be exploited ideally not just for initial and continuing education and training but also to meet individual thirst for knowledge. Knowledge is available over the Internet 24 hours a day, so that each student can independently learn as much as he or she can take in without waiting for the next class or lecture. Teaching units can even be fed into the work process without interrupting it. The boundary between work and learning thus dis-

Figure 6

Blended learning



appears. This reduces costs while improving the efficiency of distance learning and learning at the workplace. As they use the new media and the Internet, students and staff build up their media skills so that they can study as a community, but without group pressure.

Cultural and geographical boundaries are also removed. The new media give students from around the world the opportunity to study at a variety of universities, even in countries outside their homeland, and to gain access to international knowledge. Every student, regardless of the point in the world from which he or she dials up the World Wide Web, receives the same information and can easily call up the teaching and learning materials of the various providers from home.

However, although there are already graduates of virtual courses in the labour market, some people still treat the new media and new methods of learning with caution. They are afraid that they will be isolated and will have no help in handling technical problems and difficulties with the content. Another clear disadvantage is that students sit at their computers anonymously, meet no new people and find it difficult to develop any sense of belonging to a group through the virtual campus. They feel a sense of social isolation, which needs to be overcome before the course starts. There are also problems associated with the level of technical equipment, since the costs incurred in downloading material slowly via a modem can drastically reduce students' motivation.

A combination of different methods will increase the success rate of learning and is better value for money. In essence, it is clear that the disadvantages of face-to-face teaching are the advantages of learning at a computer screen. The different methods of learning each have their own advantages, which need to be combined.

In a face-to-face lecture or class, participants make contact with one another and exchange information. They thus develop important links, which have a positive effect on their performance and communications at work.

E-learning has the advantage of freedom of timing and geographical independence. It is also relatively cheap, because there are no travel and accommodation costs. Good WBT (Web-based training) and CBT (Computer based training) courses also have considerable advantages over face-to-face training in terms of speed of learning. Depending on the subject and the way in which it is applied, learning can be up to twice as fast as in the traditional classroom. However, face-to-face classes held at intervals at the university itself can help to consolidate specific topics or to explore them in greater depth, as can synchronous or asynchronous online classes. The important thing is to find a mixture of methods which suits the learning group, the goal of learning, and the technical and social requirements.

Most students are in favour of using the new media but would be against dispensing with personal contact with fellow students and lecturers. Hence, face-to-face sessions at the university are an absolute necessity.

Summary and outlook

The essential message is that virtualisation is receiving greater attention in German and European universities than any other topic. This is partly because universities have an obligation to deliver high-quality teaching, and also because the level of education is continually rising. Especially in the age of globalisation and digitalisation, it would be naïve to imagine that using the new media makes teaching less burdensome. Such an attitude would be fatal to the further development of the German universities since

teaching will not be any good unless teachers provide excellent support and have a fundamental grasp of methodological principles such as those promulgated for many years by the Fernuniversität Hagen.

It will certainly be a long time before technology is so far advanced that even the more sceptical observer is convinced of the merits of the new media and e-learning. It is not a matter of replacing one method of learning by another, but of new and old methods of teaching being used to complement one another to develop new teaching opportunities. It cannot be expected that personal contact between teachers and learners at universities will be replaced by virtual contact, but both methods of learning – 'blended learning' – will become far more common and will produce a variety of combinations.

A purely virtual university, however complex, is definitely not suited to providing basic courses in this way. Young people in initial training should benefit from social as well as cognitive impact. A virtual university cannot provide this kind of personality development achieved by fostering self-presentation and soft skills.

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Key words

Lifelong learning,
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virtual campus,
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