EUROPEAN PARLIAMENT

*DIRECTORATE-GENERAL FOR RESEARCH*

**WORKING PAPER**

# INFORMATION AND COMMUNICATION TECHNOLOGIES IN EDUCATION AND TRAINING
**(Update of 1996 edition)**

*Scientific and Technological Options Assessment Series*

*STOA 106 EN*

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# INFORMATION AND COMMUNICATION TECHNOLOGIES IN EDUCATION AND TRAINING
**(Update of 1996 edition)**

Robin MASON
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*Scientific and Technological Options Assessment Series*

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## EXECUTIVE SUMMARY

1. The impact of the Internet on learning has, if anything, been even more profound than the original report predicted, both in terms of what needs to be known and how it needs to be learned. The proliferation of information on the web has led to a greater emphasis on process - on learning how to e-learn - than on learning content. The connectivity of the web has led to the need for team-working skills and the ability to interact online with people, with resources and with ideas.

2. The present e-learning market is immature, moving from a command structure to a demand structure with all the discomfort, confusions and uncertainties that brings.

3. Whilst accreditation for learning and especially for e-learning is important and needs strengthening, there is also great demand for short, e-learning opportunities, which are just-in-time and just-the-right-amount. Training providers are working to establish standards which allow these learning objects to be interoperable.

4. The role of the teacher/trainer/tutor is changing rapidly. E-learning is empowering the individual learner so that the teacher is no longer the gatekeeper of knowledge. Technology facilitates continuous professional development for both learner and teacher. There is no evidence that the role is diminishing, but merely evolving.

5. There is a pressing need for organisations (schools, colleges, universities and training providers) to move to a more learner-centred approach to education which can be anywhere, anytime the student requires it.

6. Schools should be seen as opportunity centres, creating the habit of lifelong learning, reaching out to be a learning resource for the community.

7. E-learning has reinforced the importance of informal learning and helped to bring about a convergence between learning and working, between learning and communicating, and between learning and entertainment.

8. A robust and competent information advice and guidance system for individuals of all age groups and at all levels of learning becomes a pre-requisite in a context where individuals are increasingly being required to take responsibility for their own personal development.

# Contents

# INTRODUCTION

In 1995, the European Parliament commissioned a study on the state of the art of ICT (information and communication technologies) in education and training. The report that resulted, highlighted a number of issues which seemed the most pertinent at the time. The purpose of this review seven years on, is to consider how those issues have evolved and what new issues have emerged that were not foreseen then.

The same basic methodology has been used:

- desk research, including extensive web browsing, reviewing reports and reading academic journals;
- attendance at conferences and workshops;
- consulting with organisations and experts across Europe.

In fact, the original report was remarkably accurate in foreseeing the major impact ICT would have – now more broadly referred to as e-learning, despite the fact that the web had hardly emerged at the time. Nevertheless, there have been very significant developments which the current report now addresses.

## 1. REVIEW OF ORIGINAL STATEMENTS

Seven issues addressed in the original report are reviewed and updated:

a) The lack of large scale deployment of ICT and the experimental nature of most applications at that time.

The growth of the web, the increased access to the Internet and the de-regulation of telecommunications have led to wide scale use of e-learning and e-training during the last seven years. The UK Open University, for example, has over 150,000 students accessing resources, tutorial support and administrative functions online. The rise of Corporate Universities amongst global organisations, such as IBM, signals the growth of e-training as a viable alternative to face-to-face sessions. The school sector also has seen massive uptake of ICT in the classroom through national initiatives to equip schools and train teachers. Across Europe, we can see evidence of large scale deployment of ICT for education and training. However, this is due as much to the pervasiveness of the web in the commercial and social sectors, as to solid evidence of its value in improving learning. There is now widespread acceptance of the fact that students need to know how to use the web just to be full participants in society.

b) The original report noted that the real barriers to the take-up of ICT were not echnical, but social and educational.

This is even truer today, in that the technology has improved considerably but social and educational systems are slower to adapt. The web is infinitely more user-friendly than the command line systems of the first conferencing software. Seven years on from the first report, the need for change in the higher education sector has increased dramatically, but this need has not been felt uniformly across all institutions. Throughout Europe there are universities – especially the elite research universities - which have not experienced the same drivers to change as the less well funded institutions, and so have not developed an e-learning strategy and implementation programme. Some of these drivers are:

- reduced government subsidy and introduction of student fees;

- increased competition for students, falling population of 18-22 year olds and hence the need to find new markets;

- pressure to provide lifelong learning rather than simply undergraduate and post graduate courses.

Amongst the corporate sector, there remains a bias towards face-to-face training being the 'best', though online training is generally agreed to be cheaper. So the resistance to the use of ICT in teaching and training is still real and is still a matter of changing 'hearts and minds', rather than of providing the technology.

c) The original report highlighted the need for training of teachers, lecturers and trainers in how to use ICT for educational purposes.

This issue, acute though it was at the time, is finally beginning to fade in importance. This is partly because training schemes have been put in place (e.g. for teachers in many European countries), partly because the technology has become much more transparent (though the pedagogy of e-learning still needs to be addressed through training), and partly because of the ubiquity of computers and the Internet in so many sectors of society that many more people are familiar or comfortable with learning to use the web.

d) The report recommended that the EU research and development funding needed to become more strategic as the time for trials and experiments had passed.

   This has come about through the Framework Programmes which are much more targeted and much less 'scatter-gun' in approach.

e) An understanding of the costs of deploying ICT was considered to be lacking at that time.

   This continues to be the case in education, though the training sector generally finds it easier to produce costings of face-to-face versus e-learning (which usually show significant savings with the latter). A recent study by one of the original authors addresses the complexity of the costing issues and proposes a way forward. (See Bacsich et al., 2001).

f) The original report foresees the impact of convergence brought about by ICT.

   Convergence continues to take place on many levels, brought about by the massive popularity of the web. In the training sector, there is a convergence of learning and working; in technology, there is real convergence onto the web. For example, CD-ROMS and videoconferencing are being deployed through the web. Likewise, there is a blurring of the old boundaries between face-to-face and distance education through the incorporation of ICT.

g) The original report also foresees the growth of 'broker' institutions, now called Virtual Universities.
   There has been a phenomenal rise of virtual institutions – Corporate Universities in the training sector and Virtual Universities in higher education – to meet the 'predicted' growth of e-learning. Examples include the Finnish Virtual University and the UK e-University. In fact, many of these new institutions have already folded or are not experiencing the demand from students that was anticipated. Examples include: NYUOnline and the USOU.

## 2. UNFORESEEN ISSUES

There are two issues which definitely were not anticipated in the original report. The most significant is the notion of 'learning objects' and the associated areas of personalised learning, standards and reusable course content.

Although there is considerable disagreement about what constitutes a learning object (LO), the simplest definition is 'a digitised entity which can be used, reused or referenced during technology supported learning'. There is much more consensus about the purpose of learning objects. They must be:

- reusable – that is, they can be modified and versioned for different courses;
- portable – that is, they can operate across different hardware and software;
- accessible – that is, they can be indexed for easy retrieval using metadata standards;
- durable – that is, they can remain intact through upgrades to the hardware and software.

There is also considerable agreement about the need for LOs. This is seen to revolve around the demand for lifelong learning that is timely, personalised and targeted. In particular, new learners are said to want bite-sized chunks of learning, not whole courses. They want learning tailored to their individual context. They want flexibility of access and just-in-time content.

The second issue which was not really apparent seven years ago was the profound effect of the Internet on the nature of learning, both in terms of what needs to be known and how it needs to be learned. The proliferation of information on the web has led to a greater emphasis on process – on learning how to e-learn – than on learning content. The connectivity of the web has led to the need for team-working skills and the ability to interact online with people and with content. This will increasingly impact on the curriculum of education and training at all levels. It is also changing the role of the teacher and trainer – from 'font of knowledge' to guide, navigator, facilitator and designer of learning opportunities.

All of these issues are developed in more detail throughout this report.

## 3. WHAT IS MEANT BY E-LEARNING?

### 3.1. Overview

A review of the e-learning literature reveals considerable ambiguity and often contradictory conceptions about what e-learning actually is. This is particularly true in the training and workplace use of the term. Some definitions of e-learning carry strong overtones of computer-based training transferred to the Internet. The emphasis is on the electronic nature of the content, not the communicative potential of the web. The UK's Chartered Institute of Personnel and Development takes a different view, however, emphasising the importance of connectivity over stand-alone approaches such as CD-ROMs, satellite broadcasts, video and audio cassettes:

> Learning that is delivered, enabled or mediated by electronic technology, for the explicit purpose of training in organisations. It does not include stand-alone technology-based training such as the use of CD-ROMs in isolation. (CIPD 2002).

In the higher education literature, there is greater consensus that online learning or e-learning means electronic access and interaction with learning materials, fellow learners and tutors. The focus here is on the communicative potential of e-learning, rather than content delivery.

Practitioners of e-learning who emphasise the communicative nature of e-learning draw on constructivist and social practice theories of learning, often very overtly aiming to transform the role of the instructor to that of a facilitator of knowledge construction, and to create a social environment in which learners learn from each other online. Practitioners who emphasise the content delivery side of e-learning very often have a behaviourist or cognitive conception of learning, whether consciously or not. They focus on the development of clearly presented content, facilities for testing the learner and multimedia materials for increasing learner motivation. Access to training, reduced costs and speed and retention of learning are the attractions of e-learning for them.

To date the primary application of e-learning has been the delivery of structured programmes of study, or courses. While other approaches to learning do flourish in some organisations, the formal course leading to an award or qualification is still dominant. Within the 'course' model, however, approaches vary significantly.

### 3.2. Web-based training

In corporate training, technology is used primarily to deliver content to the end user without significant interaction with (or support from) tutors, peers or managers. A significant industry has grown up around this form of e-learning, spanning content authoring, content asset management, instructional design and learning management. Key objectives of this form of e-learning are *throughput and efficiency* of development, management and delivery of content to learners.

A cursory survey of 30 courses at 16 US companies identified three factors which contribute to the take-up of this form of e-learning in the workplace (ASTD & The MASIE Center 2001):

Marketing: face-to-face and email promotion, internal champions, testimonials.

Support: time to take the course in work hours, linking the content to business objectives, status and importance accorded to completing the course, help in transferring the learning to the workplace.

Incentives: intrinsic motivations contributing to personal development are more powerful than extrinsic factors.

### 3.3. Supported online learning

In higher education, the majority of the content of the course may be delivered through lectures or through distance-education textual material, but the course is categorised as e-learning because interaction with the tutor, dialogue with other students, the searching for resource materials, conduct of collaborative activities, access to course outlines and supporting material are all conducted online.

A recent review of 100 research papers about e-learning in higher education identified four major features of good practice (Coomey & Stephenson 2001):

Dialogue: using e-mail, bulletin boards, 'real-time' chat, asynchronous chat, group discussions and debate, the tutor or moderator structures interactive opportunities into the content of the course.

Involvement: includes responses in structured tasks, active engagement with material, collaboration and small group activities.

Support: includes periodic face-to-face contact, online tutorial supervision, peer support, advice from experts, feedback on performance, support services and software tools. This is the most important feature of successful online courses, as reported in nearly all of the 100 papers surveyed.

Control: refers to the extent to which learners have control of key learning activities and are encouraged to exercise that control. Responses to exercises, pace and timing, choice of content, management of learning activities, navigation through course content, overall direction and assessment of performance.

### 3.4. Informal e-learning

Beyond these 'course-based' approaches to e-learning are the growing opportunities for technology to support *informal* learning in the workplace. Informal learning is intimately related to job performance; it may not be formally organised into a programme or curriculum by the employer, but it accounts for a good deal of the learning arising out of interactions between colleagues, *ad hoc* personal studies, and the experience of work itself.

The technologies of most relevance to informal e-learning may be grouped into two clusters: information retrieval and knowledge construction. The former covers all forms of search and retrieval software including databases, data mining applications, information services, electronic performance support and, of course, the web. The latter covers all forms of communications technology from simple email to virtual whiteboards. Focused on the processes of human dialogue and exchange, they serve to extend the learning opportunity as follows:

Through web pages and text, audio or video conferencing, the range of people to interact with can transcend physical and functional boundaries.

Through online discussions, there is an opportunity to reflect on and reconceptualise knowledge in its expression to others.

Through online interactions, tacit knowledge is exchanged across a wider spectrum than amongst those who are physically co-located.
The technologies keep a record of interactions, files and web materials that can be retained for later use by those directly involved and others.

### 3.5. An e-learning typology

This summary of three applications of e-learning demonstrates, therefore, that the scope of the term e-learning extends across a wide range of pedagogies and learning theories. The key characteristics of the three applications are summarised in Table 1.

| **Web-based training** | **Supported online learning** | **Informal e-learning** |
|---|---|---|
| Content-focused | Learner-focused | Group-focused |
| Delivery-driven | Activity-driven | Practice-driven |
| Individual learning | Small-group learning | Organisational learning |
| Minimal interaction with tutor | Significant interaction with tutor | Participants act as learners and tutors |
| No collaboration with other learners | Considerable interaction with other learners | Multi-way interactions among participants |

**Table 1: Applications of e-learning**

These distinctions help to clarify apparently contradictory findings in the research literature, for example, over learner engagement with online material, with indicators of success and uptake of online learning, with drop-out rates and evidence of cost savings. In some cases the findings are based on the web-based training model and in others the findings come from a version of supported online learning. Much of the visionary literature draws on the e-community concept, while much of the negative doomsday writing has the CBT-on-the-web concept of e-learning in mind. All are commonly referred to as e-learning, yet they are very different kinds of learning experiences and serve different markets and purposes. Although

these three concepts of e-learning represent relatively distinct examples of current practice, in this emerging and fast-changing field, there are bound to be other models which overlap and combine aspects of these three.

Implicit in the typology are different underlying expectations of technology – differences which will diminish as corporate trainers, especially, increase their awareness of the value of peer-to-peer and peer-to-tutor interaction in leaning. Commentators such as Deborah Schreiber, however, argue that awareness raising may not be sufficient, and foresee the need for a more radical reappraisal of e-learning strategy:

> …many companies procure new [e-learning] technology but often see limited return because they do not know how best to employ it ... . Designing and implementing distance training that contributes strategically to the organisation requires not only a new organisational chart but often a transformation of the corporate culture itself. (Schreiber 1998: 393).

## 4. IS E-LEARNING A NEW PARADIGM?

How different, then, is e-learning? Does it represent a new paradigm, or will it pass into obscurity along with educational television, learning machines, overhead projectors and other media which in their day were hyped as revolutionary for learning?

There is a long tradition of research into educational technologies which compares learning through 'conventional' means with learning through technology. The outcomes of these studies have been collected together by TeleEducation New Brunswick (2001) under the title 'no significant difference'. In summary, the conclusion is that technologies rarely affect the learning outcomes – when measured by standard end-of-course examinations. While these results apply to e-learning, what the studies fail to account for is the new paradigm which technology, particularly communication technology, has engendered in society at large and hence in learning as well.

> A large part of the so-called new learning paradigm involves a shift from what has been characterised as an atomistic perspective to a more holistic perspective (Spector & Anderson 2000). The atomistic perspective emphasises individual units of learning (specific and discrete conditions, methods, and outcomes) and tends to treat learners in a similarly isolated manner (focusing assessment on individual learners and evaluation on aggregates of individual assessments). The atomistic perspective can be contrasted with the integrated or holistic perspective, which views a person as a member of a society and as a member of various language communities and communities of practice. . . This social perspective, and the realisation that learning is most often aimed at integrated collections of human activities comprise a holistic perspective of learning. From the holistic perspective, learning is ultimately aimed at improving the understanding of various phenomena and situations and not merely about recalling specific facts or solving specific problems. (Spector 2001: xv-xvi).

One way of looking at the benefits of e-learning is to disaggregate the pedagogy, the technology and the social dimensions of e-learning. The technology component is the most volatile element of the three. Already we see considerable convergence onto the web: stand-alone CD-ROMs, video- and tele-conferencing – all have web counterparts or integration mechanisms. The web itself will evolve beyond recognition with higher bandwidth, smaller 'screens', mobile access, multimedia communication and further. The pedagogy element is somewhat more complex. In many ways there is 'nothing new under the sun' regarding learning; there are just fashions and recycling in clothing, ideas, approaches and understandings about how to teach. It has been argued that tutoring online is not a new paradigm; there are skills and tips and good practice, but fundamentally, a good teacher is a good teacher in any medium (Mason 1991).

However, just as grandmother's clothes never quite come back into fashion, educational ideas are also helix-like: when they circle back around, they are subtly different – recognisable but differently combined or formulated. So it is with e-learning. The components of e-learning could be defined as:

1. multi-way communication amongst learners and between learners and experts;
2. hypertextual rather than linear presentation of material;
3. integrated access to resources both inside and outside the learning package;
4. multimedia forms of interaction and presentation of material.

While these elements may have been available individually before, the combination is new. Furthermore, connectivity over distance and time has had a profound effect not just in terms of learning opportunities, but in a wider social context. Communication through mobile phones has contributed to these changes, but the result is a different expectation about communication and access to information and people. To summarise, e-learning may not require new theories of learning to account for the nature of the learning experience, but many researchers (such as Harasim*et al.* 1995, Koschmann 1996, and Spector & Anderson 2000) conclude that it *is* defining a new learning paradigm:

> Profound changes at all levels of society and technology demand new educational responses. The paradigm for education in the twenty-first century that is emerging is network learning. Based on global interactivity, collaborative learning, and lifelong access to educational activities and resources, it provides an approach that emphasises international connectivities and engenders new ways of working, studying and problem solving. (Harasim*et al.* 1995: 278).

## 5. WHAT ARE THE BENEFITS AND LIMITATIONS OF E-LEARNING?

### 5.1. Overview

Interactivity with course content, and particularly with fellow learners and tutors, is increasingly seen to be the most significant element of e-learning. Evidence of its value in higher education is exemplified by the comments of a student on a supported online Masters programme offered by the Open University:

> The opportunity for student-student collaboration has to be, for me, the most stimulating part of the programme and the greatest opportunity in developing online learning. (IET 2000).

The results of studies of individual e-learning programmes have shown that support and feedback are the most highly valued aspects of the provision and contribute directly to successful uptake and completion (ASTD & The MASIE Center 2001). It would be hard to find research evidence that interactivity – whether with people or with learning materials – was unnecessary or undesirable. On this basis, far from a diminished role for teachers in technology enabled learning environments, Spector foresees an increased function:

> In the 1990s it was suggested that distributed learning and tele-collaboration would make traditional classroom teachers obsolete (see for example, Koschmann, 1996). This has not happened. What has happened is that learners, teachers, designers and researchers have realised that collaboration at a distance is often quite difficult and challenging. The role of the teacher is not likely to be eliminated by technology, although technology will surely affect the roles of both teachers and learners. The role of teaching in technology-intensive settings is more difficult and more crucial than ever before. (Spector 2001: xiv).

Research does show that interactivity is costly however; costly in terms of running training events, but also in terms of time, both of the tutor or facilitator and the learner. In practice, then, it is reasonable to ask, 'If some is good, is more better?' Here there is evidence that more interaction can lead to overload, unread messages and inefficiency – even when the interaction has been carefully structured and managed (Mason 1999). Referring back to theories of learning, it is obvious why this is so. Learning consists of a number of elements and stages of which interactivity is only one. Designing a learning programme or event is about balancing all the elements for the particular learners and context in which the learning takes place.

Researchers and practitioners of e-learning have drawn up lists of the advantages of the new medium as exemplified in Box 1. Such lists are inevitably 'context independent' and, in practice, it is often noted how these advantages are simultaneously disadvantages as well. For example, the flexibility of the medium easily leads learners to allow other priorities to come before logging on to the course or group work. The much vaunted interactivity easily leads to overload. The ability to jump from one resource to the next on the web (i.e. hypertext) can be over-used so that relatedness becomes an end in itself, and meaning is lost.

**Box 1: Positive features of e-learning**

Stephenson (2001) points to the following advantages of e-learning:

- Easy access to and interrogation of high volumes of diverse learning resources, including texts, pictures, library materials, learning tools and other aids to learning selected by the instructor;
- ease of access to other materials from other sources, including non-educational sources;
- ease of access to experts, inside and external to the institution;
- interaction in various modes: teacher-student, student-student, student-learning materials;
- interaction in various time dimensions: in real time (synchronous) or over a period (asynchronous);
- access to a range of personal support: by email with tutor and mentors, or through peer group discussions;
- ease of navigation to sources and persons within and outside the training course or materials;
- logging or tracking of activities for personal records, sharing or assessment;
- multiple levels of engagement to different depths of understanding, different volumes of data, difficulty of learning activities, according to individual capacity or interest;
- feedback loops, either from teachers, peers and others or from within the materials themselves through progress checking, quizzes and online assessment;
- linkages to other media, such as sound, video and TV;
- ease of access to simulations of dangerous or complex activities for learning purposes;
- choice of learning styles within the same package according to the needs of the learner;
- global connectivity and collaboration opportunities;
- flexibility of access from different locations.

### 5.2. Collaboration in supported online learning

Turning to the supported online learning model, in which the focus is on the communicative and collaborative opportunities of e-learning, the evidence is less critical, but still mixed. There is considerable research demonstrating the value of online peer learning, collaborative small group activities and discussion and debate, although much of the evidence comes from areas of the curriculum which lend themselves to reflection, tacit understanding and diffuse knowledge domains.

However, there are research studies which identify the problems and dissatisfactions with e-learning in the supported model. Three drawbacks are inevitably highlighted (Mason & Weller 2000).

- The time consuming nature of online collaboration and discussion, both for the learner and for the tutor/moderator/instructor;

- the resistance of many students long practised in individual study, to undertake collaborative activities especially those involving team assessment;

- the need for experience and understanding of the dynamics of online interaction on the part of the course designers and tutors in order to structure an online environment that encourages students to interact regularly and positively throughout the course.

### 5.3. An emerging role for informal e-learning

Research addressing the benefits and limitations of informal e-learning is very scarce. The Education Development Center in Massachusetts has conducted substantial research on informal learning in manufacturing companies, and claims that 70 per cent of job related learning takes place outside formal training events. However this study is not specifically focussed on electronic forms of informal learning (Stamps 1998; Dobbs 2000).

A CIPD (1999) study examining workplace learning, culture and performance concludes that the visionary view of new technology and global competitiveness driving a new demand for informal kinds of learning in the workplace is difficult to substantiate with hard evidence. In fact, the study claims that most broad-brush surveys of employers' training practices are concerned with training that is pedagogically structured. Workplace learning based on experiential modes of learning and integrated into production processes and the way work is organised, is difficult to define, capture and record, especially with survey instruments. The study accepts:

> We are mostly in the dark about the nature and extent of this kind of non-formal or informal learning. (CIPD 1999: 3).

However, the lack of data on informal e-learning should not be interpreted as lack of activity. In fact, almost every aspect of working and learning is being affected by 'network technologies' as Spector (2001) succinctly describes:

> One change due to network technologies involves the blurring of the traditional distinction between learning and working. Individuals may shift seamlessly from performing a work activity into a system-initiated help environment. Workers may put one complex task on hold while taking time out for a focused tutorial. Individuals may initiate background agents to gather information on selected topics which are then pushed into windows that appear in the user's desktop work environment. Workers may shift from working alone on one isolated task to seeking guidance and advice from a networked community involved in similar activities. (Spector 2001: xvi).

A recent research paper by Gerhard Fischer and Eric Scharff (1998) on technologies for self-directed learning makes the following claim:

> One of the major misunderstandings in our current debate about enhancing learning with new media is the assumption that technological advances will, by virtue of their very existence, improve the quality of learning. New technologies and media must be more than add-ons to existing practices. New technologies and learning theories must together serve as catalysts for fundamentally rethinking what learning, working, and collaborating can be and should be in the next century. (Fischer & Scharff 1998: 4).

A major finding in current business reengineering efforts is that the use of information technology has a more disappointing return on investment than expected. It is generally accepted that the major reason for this is that information technologies have been used to mechanise old ways of doing business, rather than fundamentally rethinking underlying work processes (Landauer 1995).

These studies of the application of new technologies to workplace learning present a picture not of technology failure, but of human failure to engage with the challenge technology offers for transformation. In many cases, the theories about how people learn and about how they learn in the workplace have not been applied in the design and support of learning.

## 6. FUTURE DIRECTIONS

### 6.1. Blended Learning

Any media-related term which is popularised undergoes the following trajectory: at first it is a buzz word; then it becomes over-used so the early-adopters move on to coin new words and concepts, and finally it either dies out completely or finds its rightful place as signifying a particular idea or practice. Already the early adopters of e-learning are looking around for new words or are adapting the term to cover new meanings. M-learning, meaning mobile e-learning 'on the road' or anywhere outside the office, is the latest buzz word. Meanwhile, e-learning is being re-defined as 'enhanced' learning or even 'experiential' learning.

These substitutions for 'electronic' reflect a realisation that it is not the electronic nature of e-learning which captures its true value, but rather the opportunity to integrate working, learning and community in the workplace. Furthermore, the earlier e-learning adopters have come full circle in rejecting an 'either-or' view of learning online versus face-to-face. So-called *blended* solutions often offer the most satisfactory outcomes: 50/50 models of face-to-face and online learning can combine the best of both worlds; even 75 per cent online with one face-to-face or residential meeting is successful in overcoming the limitations of online learning while benefiting from its overall cost-effectiveness and flexibility.

Importantly, blended approaches can encourage participants to make *better* use of face-to-face contact in the knowledge that preparations and follow up can be conducted online. Totally online courses should be reserved for those contexts in which it is impossible or unreasonable for learners to come together – typically international events and training courses, or projects in which learners cannot leave their operational setting. Synchronous technologies provide a partial substitute.

What does this mean for the continued investment in face-to-face and residential facilities of fixed location training? On the one hand, blended solutions to learning have strong pedagogical justifications: exposure to ideas through several different media definitely improves understanding and take-up (Collis & Moonen 2001). On the other hand, the provision of multiple media is more costly. The Open University has found that students are very positive about electronic tuition, but are less happy when it is a complete substitute for face-to-face tutorials. This has left the institution with all the costs of managing physical *and* technology-based support.

As students adjust to the notion and to the practicalities of learning online, and as the number of students with home access to the Internet grows, these replication costs may be the inevitable price of change and innovation. With each passing year, more and more administrative and tutorial services are being offered online, with greater and greater value evident in the investment in online infrastructure. However, in higher education, just as in the workplace, there are areas of the curriculum, types of experiences, and forms of tacit knowledge that for the foreseeable future still require face-to-face interaction as the primary delivery mode.

## 6.2. The Impact of the Internet

The impact of modern technologies has altered very little the popular conception of learning as a transaction between the teacher and the learner. In many European countries the predominant view of the learner is as a vessel to be filled and what is more, a vessel with a limited capacity for taking in information. Yet new technologies are having a significant impact on the whole learning system, both on the supply side and on the demand side of learning: they undermine assumptions about teaching and tutoring, about learning in one place in groups of similar ages, about the administration, the support and the accreditation of learning.

Europe is on the verge of being able to envisage universal access at all ages to computers, television and telecommunications, with their impact of speed and spread. Modern technology can bring information and communication 24 hours a day, seven days a week. It disregards time-zones and is capable of helping those who are isolated through geography, disability, infirmity or social status.

But only the individual can decide to learn and to develop a combination of knowledge, skills and understanding. The technology merely facilitates. The impact of modern technologies, and their rapid spread of availability to everyone is, unlike the impact of any other technologies on learning, raising profound practical questions at every point in the learning process.

## 6.3. The Learner

The new technologies place control of the learning process in the hands of the learner. The learner can choose the time, the place and the pace of their learning. The level, too, becomes an individual choice: e-learning is a learner driven system.

But, however much programmes of learning become individualised, however much they reflect the personal wishes of the learner, there will always be the need for directed learning. Teachers and mentors will continue to help towards the achievement of national qualifications and professional requirements – better practice in health and safety or the understanding for a sales force of a new product. The teacher will remain an essential guide to the management of learning.

There is growing certainty that at the very least, what should be learned in schools is to learn how to learn, to become a discerning learner, and to be equipped with the knowledge, skills and understanding to become an effective citizen.

The new technologies are a powerful force in achieving these objectives because they provide everyone with the means, hitherto undreamed of, to access information. Information is thus universally available. What matters more today is the capacity to use it.

## 7. THE LESSONS OF CHANGE

- Funding systems are not geared to putting funding into the hands of the leaner;

- the accreditation of e-learning and a qualifications framework for a learner driven system are not in place. For such a system, these frameworks have at the very least to be intelligible and transparent to the individual learner and not just to the professionals, as they are in a supply driven system;

- a system empowering the learner to make choices for learning requires a more accessible, robust and reliable system of information, advice and guidance, both in the election of learning choices and in support during the learning process;

- if learning can be carried out anywhere and at any time, the need for attendance at a specific geographic location within specific hours needs to be revised;

- for the 'just in time' learner, new technologies provide access to an overwhelming amount of information for college or school projects, university theses or the completion of online deals. For the development of new concepts, of new skills or of changed attitudes, the role of e-learning is far more complex. It is likely to be but a part of the process of 'blended' learning – using the appropriate mix of face-to-face and online learning opportunities. The preparation of high quality learning materials will be demanding. The process cannot simply be automated. It has been estimated that it takes some 200 hours of preparation to provide one hour of quality learning;

- the younger generation will compare the quality of e-learning materials to the very high quality of computer games. This provides a very real problem of credibility for creators of learning materials;

- the role of the teacher in a school, college or university, or the tutor in a corporate learning/training section, changes profoundly. In the case of teachers, the new learning systems will affect the basis for recruitment and the basis for initial and continuous training;

- the teacher's role becomes more the managing of learning than of teaching, but in most schools and in many colleges the electronic systems are neither robust enough nor widespread enough in their availability for teachers yet to be able to assume their part in managing the new learning process;

- in the universities, the position is rapidly changing; 72% of undergraduates going up to UK universities in Oct 2001 possessed a computer;

- for the tutors in companies, the electronic systems are likely to be in place and robust and the role of the tutor is already becoming the creator of learning systems and of learning support systems;

- in businesses both big and small the provision of equipment and of learning is likely to be judged by business benefit;

- the training for teachers and tutors becomes a process and not an event. Equipment becomes part of their lives and their focus becomes the learning process rather than the subject matter;

- the support systems for learning are a particularly appropriate area for electronic systems. Registration for courses, the management of individual learning programmes, the assessment, and above all contact student-to-student and student-to-tutor are all capable of being conducted online;

- decision-making managers in schools, colleges, universities, companies and particularly in small businesses need to understand both the potential and the limits of e-learning. E-learning technology has created its own business, and education must develop a business mentality to avoid just accepting what providers offer;

- in companies, greater emphasis on e-learning is paralleled by an increase in e-business, both brought about by the increasing sophistication and robustness of electronic systems;

- technology will continue to develop imminently with the arrival of the 3G networks, digital television and the development of broadband capabilities with smarter retrieval engines to access everything that is there. New software systems are already partly in place to allow users to plug into a web of services running across a wide variety of devices, including PCs, handheld computers, phones, television sets and game consoles;

- the public expects the Internet to be free and there is a strong academic commitment to knowledge being a free good. It is the communication networks around the courses that are key to addressing the cost base and also the question of how technology can enhance the quality of learner support;

- effective use of technology in learning can be understood as a tension around the triangle of access, quality and cost. If quality increases so too, usually, does the cost. Technology impacts on this triangle by improving access, providing a richer curriculum, and allowing learners to remain in the workplace.

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## CONSULTATIONS AND CONFERENCES

Consultations

1. Chartered Institute of Personnel and Development – Martyn Sloman
2. The British Council – Keith Williams, director of Distance Education
3. PictureTel Videoconferencing Systems – Norman Gaut, CEO
4. European Association of Distance Teaching Universities - Terence Karran
5. The e-University – Sir Anthony Cleaver

Conferences and Workshops

1. Taking the Campus Online, Jan 24-5, Aarhus, Denmark, arranged by UNI.C
2. A Co-ordinated Approach to e-Learning in Higher Education, Dec 6, London
3. How do People Learn? Feb 13, Chartered Institute of Personnel and Development
4. E-learning for SME's, Feb 15 – 18, Stornoway, The Business Lab Ltd.
5. OPUS – Workshop on Personalised Learning, Jan 11, Oxford University.
6. The New World Learning Symposium, Nov 12, London.