eLearning

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CONTENTS

Introduction

The DELPHI Project, supported by the eLearning Action Plan, aims to synthesize the results of recently completed RTD projects in an attempt to shed light into the fundamental changes arisen at the level of methodologies and learning processes necessary to propose a future agenda on the innovative use of ICT in Education and for the benefit of the European citizenry's Lifelong Learning endeavours. In principle the DELPHI Project aims to give responses and on specify the trends to a series of transversal research questions, those being:

1) What are the new methodological approaches to learning in technology-based learning scenarios and what is their efficiency? What are the new co-operative learning processes, the cross-curricular skills and changes in teaching/learning, role changes configuring technology ICT-based learning innovations? How is effectiveness considered in the different innovations analysed?

2) What are the consequences for organisations when introducing these new ways of learning, including European cross-cultural issues involved in the process?

3) What are the contributions of ICT to lifelong learning in terms of access to education and training? Does the introduction of ICT stimulate the dual society and thus social exclusion?

In parallel the project intends to utilize the knowledge generated by its sub-activities in the context of an Internet-based observatory on learning innovation. The above aims are achieved by the implementation of various activities that range from thematic study reviews to expert group discussions and from the establishment of a project's monitoring system to the maintenance of an observatory.

This document constitutes the project's third deliverable and the intent behind its development is to report on the contribution of twelve EC funded projects to the understanding of new methods to learning in technology based environments, under an indicators of change perspective and the implications of such understanding for policy purposes. The projects reviewed in the frame of this workpackage were funded by the IHP and the IST Programmes. Four IHP cluster projects were selected and eight IST ones.

The structure of the report is as such so as to allow the reader to get acquainted with the case projects reviewed, analysed and synthesized in the frame of the project's third work package under an AREA perspective rather than a sectoral one. The areas discussed in the report are:

- Pedagogical
- Institutional
- Cross-cultural/socio-economic

The work reported here gives a particular focus to the identification of

- methodological trends
- issues related to learning scenarios
- gender perspectives to ICT Assisted Learning

- socio-economic variables affecting / affected by ICT Assisted Learning.

This focus areas are reflected on the discussion presented in the last section of this report.

The Chapter that follows presents a brief discussion on e-learning under the scope of ICT based innovation in learning. It is based on the project's first deliverable and brings into the discussion new issues for debate. The second chapter discusses the methodological approach followed in the attempt to depict key indicators of change. The third chapter discusses the findings of the case studies under the three area perspective outlined above while the fourth discusses the results obtained from the review and analysis of the cases in terms of indicators. The report concludes with a set of recommendations for policy on e-learning from a pedagogical, functional, institutional and socio-cultural points of views. This last section draws input from the findings of previously done work namely the review of 18 MINERVA projects.

As indicated above the review process reported here was undertaken in order to facilitate an analytical Theoretical Structure based on indicators of change. The project's next stage activity through a reflection process is to guide recommendations for key stakeholders in the area of e-learning. These are to be disseminated through the DELPHI Laboratory (discussion forum structure) and thereafter through the DELPHI Observatory.

Chapter 1: e-learning trends

Background

The project's first public deliverable: e-learning – State of the Art, identified and discussed the areas of key innovations that need to be considered in describing the state of the art in e-learning. These have been used as the bases for the review and analyses of the case projects by facilitating the formulation of a review template, details of which are presented in the chapter of methodology. The review of the state of the literature revealed that the various definitions on e-learning all imply "innovation" through the use of ICT to the learning / teaching process. In this respect the discussion in the second deliverable focused more on parameters and factors related to INNOVATION (under various perspectives), while in this report the focus is shifting to the area perspective: Pedagogical, Institutional, Socio-economic. This is in line with the eLearning Action Plan's objective for e-Learning, which aim to:

- Help the individual to realize his or her full potential and lead a happy and fruitful life
- Reduce the disparities and inequalities between individuals or groups
- Ensure that the skills available meet the needs of business and employers and in turn suggests that e-Learning is
- based on a reliable **technology** but is **pedagogy-oriented**
- a **social process** and should facilitate interaction and collaboration between people
- implies **organizational change** and teacher/tutor training.

E-learning trends: pedagogical, institutional and socio-economic issues

DELPHI's first deliverable intended to provide an overview on the state of the art on e-learning and outlined several dimensions which have to be taken into account in considering the umbrella notion of e-learning, the most predominant ones being:

- Pedagogical / psychological view (e.g. learning concept, teaching techniques / instructional concept)
- Technological / functional view (e.g. platform requirements; features/tools)
- Organisational / economical view and
- Socio-cultural view.

As outlined in the first deliverable and expanded upon in the project's second deliverable (chapter 1) recent discussions and recently conducted reviews on e-learning suggest that while a clean definition on e-learning is far from being universally accepted from a conceptual point of view it is recognized that the concept refers to the "innovative practices in learning, mainly through the use of multimedia and the Internet (both in formal and informal settings). The role of technology in learning is to facilitate the reduction of dependencies in terms of space, time and pace of learning.

In the project's first deliverable e-learning was defined on the bases of Desmond Keegan's notion of distance education and is characterized as synonymous to on line education built on the features of

- the separation of teachers and learners which distinguishes it from face-to-face education
- the influence of an educational organization which distinguishes it from self-study and private tutoring
- the use of a computer network to present or distribute some educational content
- the provision of two-way communication via a computer network so that students may benefit from communication with each other, teachers, and staff

Similarly the ESIB policy Paper on e-learning defines e-learning as a form of formal or non-formal education aimed at attracting set learning goals, in which direct interaction between teachers and students as well as among student groups is facilitated by ICT (http://www.esib.org/policies/e-learning.htm). ESIB however, proceeds to report that the majority of e-learning courses are inspired by market driven forces, of which the cutting of costs and the provision by for-profit education institutions are the most important. Instead, ESIB considers that these reasons should not be decisive when providing e-learning. As for any other form education, self-development, the added value for society and individual, preparation for life as an active citizen in a democratic society etc. should be primarily taken into account.

The first Forum on the elearningeuropa.info portal on the discussion of the concept of e-learning, in which experts from around Europe participated, suggests that there is agreement on the need to change education and that e-learning happens to be "in the right place and in the right time". There seems to be a coincidence between e-learning as a tool and the necessity to modify the traditional model of education. A concise version of the Discussion Forum is presented herebelow.

What's e-Learning: New Paradigm or New Toy?

The first Forum on the elearningeuropa.info portal has inspired participation from experts around Europe. Many interesting opinions have been posted, highlighting the problems faced by educational institutions.

The purpose of the Forum was to discuss the concept of e-learning: its role, its potential and its definition. Two months after its inauguration, the Forum has sparked a vibrant debate.

From the comments posted, there appears to be unanimous agreement on the need to change education and that e-learning happens to be "in the right place and in the right time". There seems to be a coincidence between e-learning as a tool and the necessity to modify the traditional model of education.

The essence of e-learning

"As far back as 1985, **Neil Postman** posed the question: 'Does television shape culture or merely reflect it?' and concluded that 'The question has largely disappeared as television has gradually become the culture'. Fast-forward to 2003 and pose the same question about e-learning and you might reasonably reach an analogous conclusion," reasons **Jim Devine**, Director of the Institute of Art, Design and Technology Dun Laoghaire (Ireland), in a comment with the meaningful title "What's

e-Learning: New Paradigm or New Toy?". This question summarizes an important part of the Forum discussion.

Chris O'Hagan, from the University of Derby, provided an answer: e-learning "is not a paradigm shift. It may be heralding a shift of some kind, but the role of e-learning appears to be in exposing anomolies in the current educational systems". According to his opinion, "there is very little new 'pedagogically' in e-learning. (….) Technology is used to mimic the pedagogies of traditional teaching - lecture, seminar discussion, objective testing etc. The methods are the same, though the delivery is notionally different".

"What is the difference between learning and e-learning?", asks **Karl Donert**, International Fellow and Senior Lecturer, Liverpool Hope University College. The possible answer should consider "that learning is learning whether or not is has an extra 'e' in it or not". (…) "What concerns me is the continued hype about technology - it always seems to be moving forward without pause for reflection and consideration of the outcomes for learners. So we never really understand the processes taking place. Thus in e-learning I think we need to concentrate on the learning component rather than the 'e'. "

Jim Devine proposes that the question "might be more appropriately asked: 'What does e-learning enable?' (....) e-Learning, in terms of a set of methodological instruments, is by its very nature highly visible, public and democratic. That's the difference! But we must also ask the reciprocal question: 'What enables e-learning?' Can we be sure that the technological infrastructure is reliable and adequate, that the pedagogical and graphic design of the content is of high quality, that the level of interactivity is appropriate and, finally, that our students can reliably access the relevant portal on a regular, reliable and convenient basis?"

Does e-learning obscure learning?

Donert identified other relevant questions: "we have perhaps lost the plot - what actually enables people to 'learn'? Do we actually understand what are the processes involved?", and in conclusion "We need to analyse and evaluate the learners, understand their needs, requirements, preferences and actions before they e-learn. Far too much attention is concentrated in the technology, in hands of the e-community, rather than the learning communities".

In a similar way, **Claude Almansi** from the Associazione di Diritto Informatico della Svizzera italiana, thinks that "the technology is made obtrusive and obnoxious instead of facilitating by the "e-community"(...), although "the "e" can simplify learning greatly - and make it much more interesting, and enhance the responsibility for learning.

Looking beyond the "hype on technology", **Mike Sharples**, from the University of Birmingham shares an example in which technology and learning appeared to be harmoniously integrated: "Yesterday I visited a school (Ninestiles, in Olton near Birmingham UK) where all 800 children in the first years of the school have laptop computers, connected to a wireless network throughout the school. The children can also take their laptops home to work on school and personal projects. What struck me

is that in this school, there is no clear distinction between learning and e-learning. The separation between the technology and the education is beginning to disappear, the children use computers as a natural part of their classroom and home education, and the school will soon be starting to remove separate computer labs."

Identifying the specifical nature of e-learning

Alexandra Draxler, Formerly Secretary to the International Commission on Education for the Twenty-first Century Initiative, summarizes the 4 elements one can examine to observe the differences between e-learning and face to face learning:

1. Information acquisition.
e-Learning transforms the process of information acquisition into something more directly under the control and responsibility of the learner, where the mediator is either non-existent or in a role of counselor. It is also a process.

2. Transformation of information into knowledge.
e-Learning liberates the learner into a world of almost infinite sources of information, and there is little to guide the learner. The traditional guides (judgement of teacher, choice of information to put into a library) are not operative, and the learner has a great deal of responsibility in choosing, sorting and evaluating that information. The transformation process is more open, more subject to individual choice and judgement, and therefore both promising and dangerous.

3. Mediation.
The mediation process can to some extent be freed of human intervention. The human interchange is potentially more immediate, more intense, but also freer of constraints (one can walk away from a machine more easily than a person).

4. Validation.
Here the difference between e-learning and other types is small: most of the same techniques and issues prevail. It might be useful to seek out what significant ifferences and opportunities exist.

Mike Sharples's observations on the integration of e-learning seems to illustrate perfectly Alexandra Draxler's description: The school he visited in Birmingham "is also moving towards a programme of more independent, resource based learning, with the children choosing their pattern of study. The teachers are enormously motivated, not only about the technology but also about the opportunities for student-centred learning". Notably: "this change has not been brought about by the technology, but by the interaction between teachers and students, technology and learning.

Returning to the initial question posed by Jim Devine, **Ulla Gjorling**, from the Danish project 'Pedagogical ICT Licence', posted a comment that integrates many of the discussion themes: "e-Learning, the Internet, CAL or whatever technology that has hit education may speed up evolution but they are not the initial reasons for change. Educational debate has evolved around problem based learning, situated learning, process writing, differentiation, project based work etc for quite a long time now.

These signal words are part of the educational debate because ideas about teaching and learning are moving in that general direction - not because the Internet was invented. The Internet, elearning and other e-tools are hand-in-glove as far as current educational ideas are concerned. Our task is to make sure that educationalists realise this and to make sure that they acquire sufficient competencies to fully utilise these excellent tools".

This first article summarizing the Forum aims to reflect the main discussion theme: the essence of e-learning, between technology and pedagogy… and beyond both (shortly we'll offer more articles summarizing other discussion themes, such as the role of e-learning within the University).

(**ABOUT E-LEARNING,** *Summarizing Our First Forum,* 2003-09-22, http://www.elearningeuropa.info/)

With respect to the DELPHI objectives the issues to be taken into account are dealing with the organisational (institutional), pedagogical and sociological/cross-cultural dimension of e-learning. The technological view is certainly another important dimension for investigation. However, a focus needs to be set to the views which are the most crucial ones for successful policy development. The DELPHI Consortium has identified the following issues as indicators for innovation which need to be matched to current e-learning practices and trends as these are reflected in the project's case studies.

Table 1. Template for areas of key innovations in e-learning

Pedagogical issues	**Organizational and institutional issues**	**Socio-economical issues**
Teaching and learning philosophy	Large scale operations	e-learning standards
Teaching techniques, methods, and devices	Cost effectiveness	LMS systems
Assessment	Incentives	Systems integration
Teacher workload	Flexibility	Globalization and competitiveness
Teacher training	Accessibility	Funding and commercialization
Teacher collaboration		Mobile learning
Bandwidth and rich media		
Other issues	Other issues	Other issues

Source: Del. 1: e-learning – The State of the Art, p.4

Reviewing the literature we observe that the term of "Innovation" is used on a very broad scale based on different definitions, ideas and perspectives presented in the discussion of introducing ICT to education. As more it is used, as more it is discussed what it really means and how to adapt the term adequately in the on-going debate of ICT innovations. An example of the "innovation" debate can be found at http://www.innovation.cc/articles/definition.htm ("An Exchange on Definitions of Innovation from the Innovative Management Network"). Innovation can be classified into domain (e.g. industry, medicine, education) and scope. It can be remarked that

most of existing definitions are related to the industrial domain, where mostly technology (product) is seen to be the core of the definitions. But if applied to teaching and learning innovation can be process-oriented as well, describing progressive changes and goals in relation to the process of organisational change as well as the process and flow of knowledge. Tony Bates defines 4 different categories for innovation: organisation, administration, curriculum design and instruction (http://cade.athabascau.ca/vol2.1/shale.html). Focussing on the field of educational technology these perspectives are added to more technology-oriented approaches and even mixed, leading to a more general and abstract picture about the meaning of the term.

There are various aspects as to how information technology is used in education: as a platform for the development and delivery of products for teaching and learning and as a tool for the organisation of the learning contents and resources as well. This covers relevant aspects about environments **and** courses which cannot be analysed separately due to their inter-dependency. The question arises as to whether open and flexible learning environments built on information technology will lead us to qualitatively better, more effective and more efficient education and how these new educational models have to be brought about.

Since the Internet enables educational institutions to reach a diverse population and to provide telematics-based education, widespread activities take place in order to develop and provide education and training throughout Europe. The increasing impact of ICT on organisational structures and political decision making can be stated on several parameters like the increasing trend of cooperations in education. The US Oklahoma universities are a recent example of collaborative delivery of courses, based on an e-learning approach for joint education (http://www.rose.cc.ok.us/, http://www.ucok.edu/) The constitution of the (virtual) Phoenix university is another prominent case of joint activities in education based on the integration of ICT. But still concepts are needed directing towards organisational improvements on effective open flexible learning.

Education currently faces a period of transition in which old paradigm are opposed to new ones. Without going too deep into the history of education via computer and computer-networks it should be mentioned that there are different types of environments and courses varying in their approach to which extent they are attached to traditional methods of place-based or distance education or how far they are connected with new learning theories and their implementation. By analysing the projects funded by the European Community, all the different types of learning environment can be found. ICT is therefore not prone to support one particular type of learning environments. On the contrary, in the design of ICT-based educational innovations, the technology will have to be introduced in such a way as to create and support the learning environment desired. However, in practice we notice that the development of a virtual learning environment can be a result of a pragmatical decision at the institution too, as it was expressed in many cases. This can also be used as a step for introducing the evolutionary transition from traditional teaching environments towards settings related to ideas of social constructivism. The evolution of learning environment is a complicated process, where institutions cultural and historical situation with practical arrangements is often the critical factor, not the learning theory (see Bourdieu & Passeron 1977).

Instructional methods and the quality of courses within the different environments can hardly be compared, since it is the whole setting of the educational activities which must be considered too. Some environments are based on the virtual mode to a full extent, others are linked to traditional courses talking place on a local school/university campus. Some are taught to an international audience, others to a local community, some course topics need different pedagogical features than others and finally it is the applied hardware and software technology as well determining some of the key indicators of the context. This influences the structure of the virtual environment as well as the methods being applied.

In a typical setting these courses are based on written learning material available in an electronic and/or printed version, including questions, exercises and tests to be completed and maybe some discussions taking place "on-line" with a tutor from a remote place. Other similar, more telematic oriented applications consist of a more teacher-centred approach, where lectures are held in similar ways of instruction as in traditional education are applied. A typical adaptation of this concept by means of instructional technology is real-time two-way videoconferencing in order to simulate traditional classroom teaching. In general we observe that in practical teaching situations the methodology used in computer assisted instruction is moving more and more into ICT assisted knowledge construction, distributed expertise and collaborative learning. Hyper- and multimedia-based sources of knowledge have replaced in many cases traditional study books with electronic books. ICT and networking can make the learning environment more open in terms of knowledge acquisition in all phases of education. The rising acceptance of online courses hints to the fact that the people value the advantages of studying independently of time and place. Experience shows that they appreciate more communication-oriented approaches where participants have to be actively involved and are taken care of daily.

Whereas the old paradigm is based on the concept of knowledge transfer (knowledge from person A to be transmitted to person B) the new paradigm relies more on constructivist principles. According to these ideas, that learner construct their knowledge by their own and that a simple transfer is not possible, active learning must be encouraged. Contemporary learning theories emphasise problem solving in the learning process. They also take into account the social nature of learning and the complexity of students' acquisition of knowledge. The learning process requires negotiation (Cennamo *et al*, 1996). Constructivist ideas of learning and knowledge underlying learning environments, open learning and project study are closely connected with considerations of the nature of knowledge in the teaching and learning process. The role of the teacher is changing to a large extent. Within the context of new educational paradigms the new functions can be characterised by the shift from acting as a content provider and "transmitter" towards a mentor guiding and supporting learners through the process of knowledge acquisition.

A reasonable conclusion of this is that there currently are a need for integrative concepts for the implementation of open and flexible learning via IT in education that can demonstrate a methodology of good practice for educational needs. Problems relating to this lack of a full and encompassing concept has to be seen from different perspectives and within different contexts of education. The implementation therefore

depends from pedagogical, sociological, legal, technological and organisational as well as other factors.

It is still not clear to what extent the use of ICT and virtual learning environments will affect daily life of teachers and learners. Since educational activities take place in a varying settings, it has to be analysed how far an organisational structure (e.g. of university education) has to be changed or adapted in order to allow effective teaching and learning. Presuming that pessimistic statements which refer to an incompatibility of ICT-use with traditional education, as articulated by Hoda (1997), are wrong there is still a consensus needed on how people learn in order to find sound strategies for ICT-implementation and for providing effective education in Virtual Learning Environment settings.

In their study about the evaluation of environments Britain and Liber (1999) define two crucial issues for the work with Virtual Learning environments:

- VLEs should provide opportunities to improve the quality and variety of teaching and learning that are not being achieved using current methods.
- VLEs should reduce the administrative burden on teachers, thus allowing them to manage their workload more efficiently and to be able to give more time to individual students educational needs.

Considering these requirements as one of the starting points for the study about teaching and learning it becomes obvious that the approach for analysing the process must reflect various other aspects too than just the discussion of pedagogical techniques within Virtual Learning Environments.

In an open learning environment, learning can be largely directed by the learners themselves. Therefore the meaning of mentoring and tutoring, a system for supporting learning and study guidance, gets special emphasis. Tutoring can mean support related to the learning process, study contents, tasks or technical problems. According to Daloz (1990) effective mentorship is akin to "guiding the student on a journey at the end of which the student is a different and more accomplished person. In a formal learning situation, mentoring functions can be understood as variously providing support, challenge and vision." Tools for providing both tutoring and mentoring should therefore be adaptable for each purpose in Virtual Learning Environments.

Whatever kind of techniques is being used it becomes clear, that pedagogues need special training for online-education. They must especially be qualified in knowing

- how to decrease anonymity and to establish the atmosphere of a learning community
- how to motivate and keep the motivation of learners high; how to avoid student frustrations
- how to establish and maintain interaction among students, between teacher and students and between the user and the system,
- how to moderate discussions.

There is a set of tools and "tricks" which can be applied. Nevertheless this must be taught to the staff concerned to avoid any repetition of same mistakes, same explorations and even in order improve the applied methods in detail.

Activities are needed relating to research, implementation and training. In this respect Activity Theory appears to be gaining a predominant role in the shaping and evaluation of innovative learning processes. The speed of technological innovation forces policy to immediate react and to stimulate the speed of educational innovation as well for adequate application of ICT. It is not doubted that education is already changing with the increasing availability and implementation of ICT in educational settings (schools, universities, home, work place etc.). However, the current situation of using ICT for teaching and learning on the European level does appear to be at a not satisfactory level. Whereas the speed of technological innovations is increasing rapidly, adequate concepts are still needed for the educational use. Further research will contribute to a better integration of ICT in education and training supporting more effective learning. However, in order to avoid […] future actions should be directed towards either solving focussed "problems" or improving the situation of traditional education (with ICT). Furthermore investigation is needed on the potentials of pedagogical concepts and technologies of new educational approaches, which might better contribute to meet the needs of current and future education. This includes the exploration of scenarios and experimentations in order to verify effects of different settings for learning.

With respect to new pedagogical approaches collaborative learning remains a crucial issue to be further on explored in the future from different perspectives, taking into account organisational aspects on co-operation and collaboration as well as pedagogical, including staff development and pedagogical work in networked educational settings. Experiences are needed demonstrating sustainable results and concepts of good practice, analysed in a multi-cultural/European educational settings and based on different technological approaches.

As many cases show, use of information technology in education and training can result in increased flexibility between working life and study by bringing learning opportunities to the work place and by bringing working life closer to school. A prerequisite of open learning systems is, however, that educational policy and stakeholders such as educational institutions, libraries and other information sources, as well as industry and commerce begin to perceive education from the viewpoint of lifelong learning. This requires collaboration and networking between the various parties.

The need for political measures had been recognised quite early in the discussion process of the implementation of ICT in education. Some countries started soon with investments and activities in ICT infrastructures and accompanying measures, others became late in developing an own strategy. Whereas the need never had been ignored it was mainly a question of national priorities and of available financial resources preventing or stimulating diverse national trends at a European level. The first European report on quality indicators of lifelong learning from July 2002 published the following table demonstrating the different national emphasis given to expenditures in education in European countries:

Total public expenditure on education as a percentage of GDP

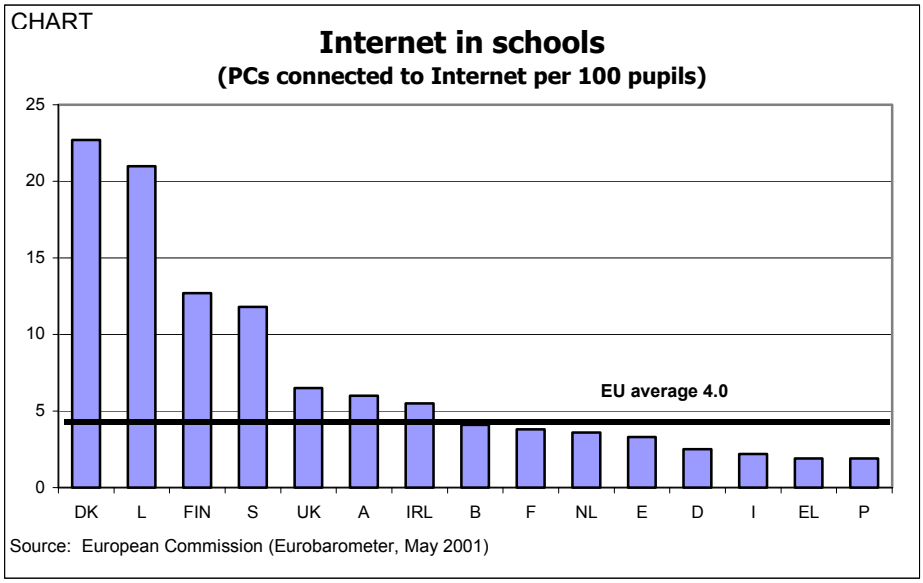
*(p)[1]	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
EU	5,68 %	5,71 %	5,52 %	5,40 %	5,44 %	5,44 %	5,34 %	5,35 %	5,23 %	5,18 %	5,03 %
Belgium	:	:	:	:				5,19 %	5,64 %	:	:
Denmark	:	:	:	:	7,67 %	8,09 %	7,94 %	8,22 %	8,00 %	:	:
Germany	:	:	:	:	4,71 %	4,80 %	4,73 %	4,66 %	:	:	:
Greece	:	:	2,66 %	3,04 %	2,87 %	3,07 %	3,44 %	3,48 %	3,66 %	3,51 %	3,52 %
Spain	:	4,77 %	4,89 %	4,71 %	4,66 %	4,68 %	4,54 %	4,49 %	4,50 %	4,46 %	4,45 %
France	5,35 %	5,59 %	5,93 %	5,93 %	5,97 %	5,95 %	5,97 %	5,89 %	5,89 %	5,83 %	5,75 %
Ireland	5,95 %	5,97 %	6,10 %	6,13 %	5,74 %	5,92 %	5,74 %	5,29 %	5,00 %	4,78 %	:
Italy	5,38 %	5,39 %	5,43 %	5,04 %	4,87 %	4,86 %	4,57 %	4,55 %	4,55 %	4,62 %	4,49 %
Luxembourg	:	:	:	:	4,26 %	4,00 %	4,07 %	:	:	:	:
Netherlands	5,09 %	5,37 %	5,17 %	5,07 %	5,01 %	4,96 %	4,79 %	4,87 %	4,78 %	4,93 %	4,91 %
Austria	:	:	:	:	6,53 %	6,41 %	6,30 %	6,28 %	6,31 %	:	:
Portugal	:	:	:	:	5,37 %	5,53 %	5,59 %	5,60 %	5,73 %	:	:
Finland	7,26 %	7,29 %	6,88 %	6,73 %	6,87 %	6,96 %	6,47 %	6,24 %	6,19 %	5,97 %	:
Sweden	:	:	7,61 %	7,47 %	7,46 %	7,62 %	7,89 %	7,98 %	7,74 %	8,39 %	8,33 %
United Kingdom	4,96 %	5,16 %	5,21 %	5,16 %	5,04 %	4,84 %	4,66 %	4,58 %	4,60 %	4,86 %	4,76 %
Iceland	:	:	:	:	4,88 %	5,32 %	5,41 %	5,98 %	:	:	:
Norway	7,92 %	8,02 %	7,97 %	7,83 %	7,15 %	7,00 %	7,65 %	7,68 %	7,36 %	6,60 %	
Bulgaria	:	:	:	:	:	:	:	:	:	:	:
Czech Republic	:	:	:	:	:	:	:	:	4,4 % (p)	:	:
Estonia	:	:	:	:	:	:	:	:	7,4% (p)	:	:
Latvia	:	:	:	:	:	:	:	:	6,3% (p)	:	:
Lithuania	:	:	:	:	:	:	:	:	6,5%	:	:

[1] (p) PROVISIONAL as the figures are still being validated

									(p)		
Hungary	:	:	:	:	:	:	:	:	6,5% (p)	:	:
Poland	:	:	:	:	:	:	:	:	5,0% (p)	:	:
Romania	:	:	:	:	:	:	:	:	3,4% (p)	:	:
Slovenia	:	:	:	:	:	:	:	:	:	:	:
Slovakia	:	:	:	:	:	:	:	:	4,3% (p)	:	:
Cyprus	:	:	:	:	:	:	:	:	5,7% (p)	:	:
Malta	:	:	:	:	:	:	:	:	4,7% (p)	:	:

Source: http://europa.eu.int/rapid/start/cgi/guesten.ksh?p_action.gettxt=gt&doc=IP/02/971|0|RAPID&lg=EN&display

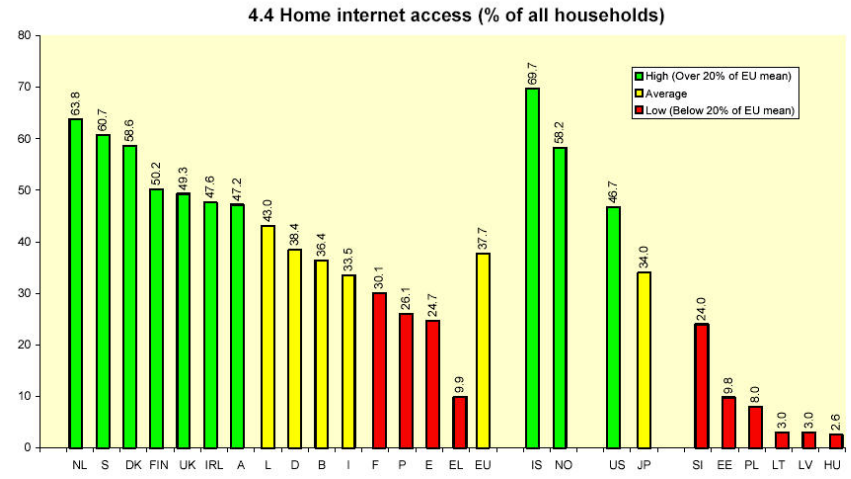
We can observe that public budgets for educational expenditures is varying in European countries and decreasing in most cases. Taking a closer look to the ICT infrastructure in European school education the assumption becomes more obvious that more investments might be needed. According to the results of another study relating to the Internet infrastructure in school education [eEurope Benchmarking Report eEurope 2002, http://europa.eu.int/information_society/eeurope/news_library/new_documents/benchmarking/benchmarking_en.doc] - a quite unbalanced situation is to be remarked among the European countries:



Furthermore the report states that":

- On average, there are 12 pupils per off-line computer and 25 pupils per computer connected to the Internet. Half of these computers are less than three years old. However, there are considerable differences between Member States.
- Connectivity remains dominated by narrowband technologies: over two thirds of school connections are ISDN and the others mostly dial-up via a regular phone line. Broadband technologies are marginal, although ADSL and cable modem are now more widely used in a few countries.
- Whilst computers are now used by a majority of teachers, only a minority of them use the Internet for educational purposes. The main reasons given by teachers who do not use the Internet are poor levels of equipment and connectivity. Lack of familiarity does not seem to be a major problem. More than half of Europe's teachers have been trained in the use of computers and the Internet, around 90% of teachers use a computer at home and approximately 70% have an Internet connection at home." [p. 7]

Taking a closer look at the ICT infrastructures and Internet available in private households we observe the same unbalanced situation.



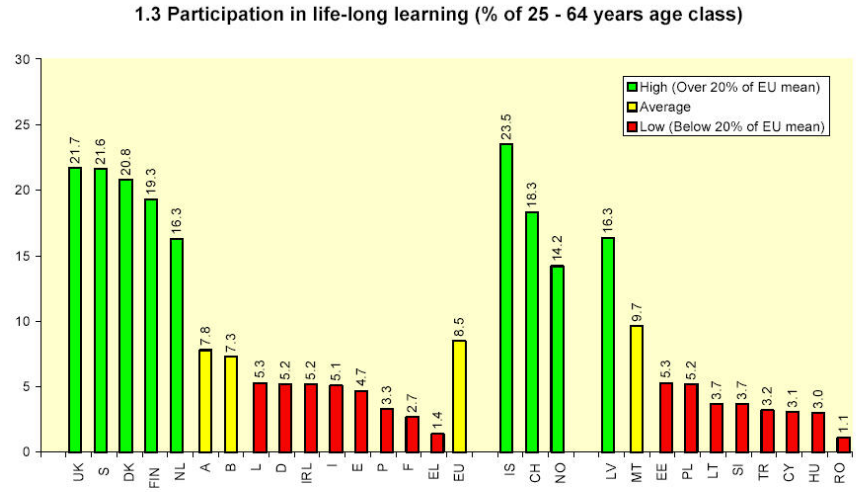
Sources: EUROSTAT/Eurobarometer; GSO survey for EE, HU and LV; years used: 2001 for all countries, except 2000 for JP, HU and LV.

In conclusion, there is a small group of pioneer countries that are ahead in terms of equipment, connectivity and usage. And there is a considerable number of Member States that are far behind. Although improvements are to be remarked concerning the "digital divide", there is still a gap between the haves' and the have nots' as one reason for diverse starting points of educational policy. As J. Devine[2] recently stated in his article on e-learning "surely e-learning is no more than a manifestation of e-living. However, while in some countries poor ICT infrastructures are accompanied by certain other bottlenecks in education; it does at least not prevent national research centres from participating in European research activities.

[2] e-learning europa

This situation impacts the participation in lifelong learning activities, as we can observe from the benchmarking report on "Lifelong Learning for Innovation" []

Participation in Lifelong Learning (25 – 64 years old)



Sources: EUROSTAT, Labour Force Survey; GSO survey for CH, LV, MT and TR; years used: 2001 for all countries, except 2000 for CY, 1999 for CH, 1997 for A and IRL, and 1996 for TR.

According to the ideas of the Maastricht treaty, the declaration of Bologna and the conclusion from Lisbon special attention is given to the equal access and use of ICT in European education, contributing as well to more harmonisation of educational systems in Europe. As a consequence of the aim to modernise European economy some of these ideas were formulated within the eEurope Action plan 2002 (presented in June 2000, Feira, Portugal) contributing the 2 subsequent Calls for Proposals within the eLearning Action plan. The aim of the eLearning initiative of the European Commission is to mobilise educational and cultural communities, as well as the economic and social players in Europe "in order to speed up changes in the education and training systems for Europe's move to a knowledge-based society". This key objective as presented on the web-site of the European Commission (http://www.europa.eu.int/comm/education/elearning/index.html). It furthermore introduces to key measures supported by the Elearning Action plan, such as: key measures relating to infrastructure and equipment; key measures on training; key measures on services and content; key measures to strengthen cooperation and dialogue.

Since European projects differ from in goals, contents and methodology, it is difficult to generalise their impact in regard to certain relevant aspects connected with technology, education and learning. Even when the objectives and outcomes are similar from a point of view that it would allow more general conclusions, there is a lack of initiatives and structures synthesising relevant outcomes in order to generate new information concerning the research connected with applying ICT in education.

The content that follows is but an attempt to concert existing practices and knowledge in meaning-making for a policy articulation tool.

Chapter 2: Methodology

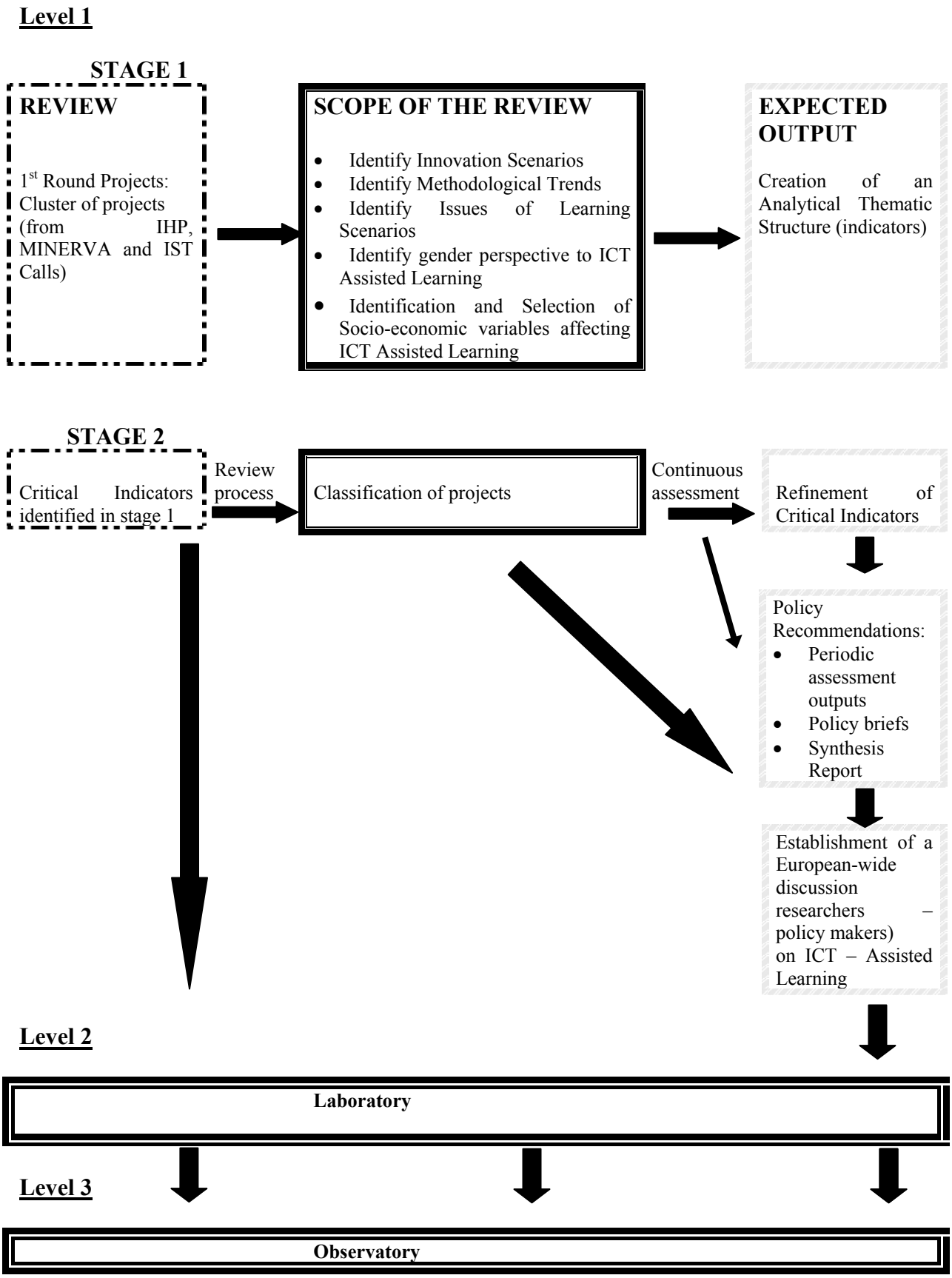
DELPHI is a project of a meta-evaluation and reflective nature. The aim is, through a critical review of the outputs of the recent research projects of similar thematic orientation (Innovation in ICT-Assisted Learning), to propose a dialogue agenda between the "projects" (project outputs) and policy makers.

The review of different sets of projects is undertaken in order to identify similarities/differences and trends of organizational, socio-economic and pedagogical nature which will facilitate the formulation of indicators for the assessment and evaluation of on-going projects. A critical analysis aims to define the specific pedagogical and socio-economic parameters for the discussion between the investigated projects and policy making.

The project set as a starting point a set of transversal research questions, those being

- what are the new methods and technologies (supporting these methods) and what is their efficiency? What are the changes in teacher-pupil roles, and in the whole learning environment?
- what are the new learning processes, the new cross-curricular and communication skills, the market-oriented issues, and , specifically, the new collaborative learning methodologies involved?
- what are the components of cost-effectiveness and cost-benefit analysis in these respective projects, and what are the results included in the final reports (taking into consideration how cost/effectiveness and cost/benefit is defined in the projects)?
- what are the contributions of ICT to lifelong learning in terms of access to education and training? Does the introduction of ICT stimulate the dual society and thus social exclusion?

While the project does not claim to seek for answers to all of the issues implied above, it explores into those issues that appear to affect the implementation of innovation in learning environments.
The project's first stage activity is operationalised at several levels through a 2-phase approach where the first constitutes a reflective meta-evaluation process of work carried out with the support of the Calls of IST, IHP and MINERVA and the second consists of a summative assessment of the outputs of the on-going projects or projects recently having reached the completion stage. The Context/Input/Process/Product Evaluation Model constitutes a frame of reference for the organization of the work undertaken. The Model has been selected amongst others due to its strength to identify policy implications at various levels of project activity and contexts.
The project's strategy approach towards the identification of critical indicators of change is presented below.


Level 1
STAGE 1
REVIEW
1st Round Projects: Cluster of projects (from IHP, MINERVA and IST Calls)
SCOPE OF THE REVIEW
Identify Innovation Scenarios
Identify Methodological Trends
Identify Issues of Learning Scenarios
Identify gender perspective to ICT Assisted Learning
Identification and Selection of Socio-economic variables affecting ICT Assisted Learning
EXPECTED OUTPUT
Creation of an Analytical Thematic Structure (indicators)
STAGE 2
Critical Indicators identified in stage 1
Review process
Classification of projects
Continuous assessment
Refinement of Critical Indicators
Policy Recommendations:
Periodic assessment outputs
Policy briefs
Synthesis Report
Establishment of a European-wide discussion researchers – policy makers) on ICT – Assisted Learning
Level 2
Laboratory
Level 3
Observatory

The work reported in this document concerns part of stage 1 activity and more specifically the review of Information Society Technologies (IST) and Improving the Human Potential and Socio-economic Knowledge Base (IHP) supported research and development projects. The activities undertaken include:

- selection of projects
- refinement of review parameters
- refinement of the review instrumentation
- negotiation with projects
- review of project documentation
- drafting of case project reports
- synthesis of case project reports

under the scope of identifying critical indicators of change in the areas of pedagogy, organization and socio-economics aspects. The work undertaken was influenced by the pre-selected dimensions and associated review parameters, as those are defined at the level of the proposal and enhanced with contributions from the project's review into the state-of-the-art on e-learning and the review of MINERVA supported projects.

The initial template designed for the review of the MINERVA projects (WP2) was slightly changed as the experience of the review suggested that such a change was needed in order to draw more inputs from the reviewed projects. The revised instrument is more open-ended in nature and includes parameters that were not taken into account in the initial design. It should be noted here that DELPHI reviewed/analysed MINERVA projects prior to the IHP and IST Programme projects as those, due to the nature of the Programme itself are more pedagogical oriented, principle concern in ICT-based learning. Such an orientation facilitated the identification of pedagogically-driven/related indicators of change and the concern over organizational and socio-economic issues are reviewed more in-depth in the frame of the IST and IHP projects.
The instrument used for the analysis of projects is presented in Annex I.

The twelve case-studies that are analysed in the frame of DELPHI's third workpackage were selected amongst the set of all recently completed (or nearly completion) IST and IHP projects/studies. In the selection of the eight IST projects consideration was given to the coverage of the Programme's Application Areas, which are: Open Platform and Tools for Personalized Learning, European Youth in the Digital Age, The Flexible University, Advanced Training Systems, The Learning Citizen, Pioneering Research for the Future of Learning, Consensus Building for Education and Training and Preparing for Future Research Activities. The specific aims for these Application Areas are given in ___. Upon a close consultation with an IST Programme Official and brief review of the existing documentation the Workpackage Coordinator selected and proposed to the consortium the following subset of case projects:

- TimeToLearn (Area: Preparing for Future Research)
- Mobillearn (The Learning Citizen)
- K2 (Consensus Building for Education and Training)
- KITS (Advance Training Systems)
- CUBER (Flerxible University)
- Weblabs (Pioneering Research for the Future of Learning)
- 3DE (Open Platforms and Tools for Personilized Learning)

- ITCOLE (European Youth in the Digital Age)

This subset comprises of one project from each of the Programme's Application Areas, ensuring the representation of all key aspects reflected in the Programme design. The selection of the IHP projects was facilitated by the review of the "Briefing Papers" prepared for all IHP projects (http://www.pjb.co.uk/npl/#Briefing%20Papers). Selected were four cluster projects representing the Programme's four principle cluster areas (Research on Higher Education, Research on school-to-work transitions, Research on new governance models for education and training, Research on the use of information and communications (ICT) in learning and Research on education, inequalities and social exclusion)

The corresponding cluster projects include: Education, equity and social exclusion, Education and Labour Market Change, Towards the Learning Economy and SYPREDEM. The partnership reached agreement on the selection of projects and the distribution of the workload during its second project meeting (Innsbruck, October 13 and 14th, 2003). The workload was distributed amongst the partners in a manner that reflects their individual expertise and research interests. Each undertook the review of two projects. Specifically the distribution was made as following:

- University of Barcelona: 1 IST (TimeToLearn), 1 IHP (Cluster 5: Towards the Learning Economy + LCCN)
- MMU: 1 IST (Mobillearn), 1 IHP (Cluster 1: Education and Labour Market Change: The Dynamics of Education to Work Transitions in Europe)
- MCI: 2 IST (K2, KITS)
- NKI Nettskolen: 1 IST (CUBER), 1 IHP (Cluster 2: Education, Equity and Social exclusion)
- Universität des Saarlandes, Institut für Rechtsinformatik: 2 IST (Weblabs, 3DE)
- FORTH/IACM: 1 IST (ITCOLE), 1 IHP (Cluster 4: Synergy between Practitioners' needs and opportunities, Research orientations and Decision Making on the usage of ICT in primary and secondary education).

As primary source of information on the case projects used were:

a. the project's final report and the most relevant deliverables
b. content available in the project's web site
c. in some cases academic articles, and books presented by the projects' partnerships

Following the review of publicly available documentation on the project cases the research teams attempted contact with the projects' contractors. This action resulted in the gathering of additional information on the projects and their activities and or clarification on project objectives, findings and conclusions. It should be noted here that there were instances where the response level was high –as in the case of the cluster project Social Exclusion and Equality in Education, but also instances were there was but a little interest to collaborate.

Information on the case projects was classified on the bases of the parameters implied by the template used and was thereafter documented in case reports that are available in DELPHI's *"Observatory site / Laboratory"*. Similarly the information gathered

from the 12 case reports was synthesized under the scope of documenting indicators of change for the three principle areas of DELPHI's research interests. The section that follows describes the case projects reviewed followed by the identified indicators of change and their implications to policy articulation.

Chapter 3. Description of cases

3.1 Methodological Approaches to ICT-based Learning in ICT and IHP projects

Introduction

Wilson (1996) has described the relationship between the ideas of knowledge and the consequences for the nature of the learning environment (author's comments in parentheses):

Metaphor about knowledge, knowing	**Consequence for the learning environment**
Knowledge is a quantity or packet of content waiting to be transmitted	Products that can be distributed via different methods, media. (Electronic self-study materials)
Knowledge is a cognitive state as reflected in a person's schema and procedural skills.	Combination of teaching strategies, goals and means to change the schemes of thought in the individual. (Teaching programme)
Knowledge is a person's meanings constructed in interaction with one's environment	The student acting and working in an environment with plenty of resources and stimuli. (Collection of tools and resources)
Knowledge is enculturation or adoption of a group's ways of seeing and acting.	Participation in the everyday life and activities of the community. (Collaborative working environment; can also include the above-mentioned items)

Table 1. Relationship between the ideas of knowledge and the nature of the learning environment (Wilson,1996)

By analysing the concepts of environments and courses where information is given on the Internet, all the mentioned types of learning environment can be found. ICT is therefore not prone to support one particular type of learning environments. On the contrary, in the design of ICT-based educational innovations, the technology will have to be introduced in such a way as to create and support the learning environment desired. However, in practice we notice that the development of a virtual learning environment can be a result of a pragmatical decision at the institution too, as it was expressed in some of the cases. This can also be used as a step for introducing the evolutionary transition from traditional teaching environments towards settings related to ideas of social constructivism. The evolution of learning environment is a complicated process, where institutions cultural and historical situation with practical arrangements is often the critical factor, not the learning theory (see Bourdieu & Passeron 1977).

Taking a closer look on the courses internationally given in Virtual Learning Environments we observe that in practical teaching situations the methodology used in computer assisted instruction is moving more and more into ICT assisted knowledge construction, distributed expertise and collaborative learning. Hyper- and multimedia-based sources of knowledge have replaced in many cases traditional study books with electronic books. ICT and networking can make the learning environment more open in terms of knowledge acquisition in all phases of education. It is not doubted that education is already changing with the increasing availability and implementation of ICT in educational settings (schools, universities, home, work place etc.). However, the current situation of using ICT for teaching and learning on the European level is not satisfying many actors involved. Whereas the speed of technological innovations is increasing rapidly, adequate concepts are still needed for the educational use. Further research will hopefully contribute one day to a firm integration of ICT in education and training supporting more effective learning.

Synthesis of pedagogical aspects

In the DELPHI cases analysed pedagogical innovations are identified and addressed only to a limited extent. Due to different orientations (given by objectives) in general, IHP cluster projects provide little insight to the pedagogical dimensions of ICT-supported learning. Cluster 1 (Education and Labour Market Change: the Dynamics of Education to Work Transitions in Europe) only refers to some results from the DELILAH project and the definition of "learning patrimonies" (series of prevailing socio-institutional and educational practices, educational practices, relations and a set of values, dispositions, attitudes and expectations in regard to educational and training) as a new conceptual/methodological approach. IHP cluster 2 projects (Education, Equity and Social exclusion) reports that "the area of pedagogical innovations is the least developed one and focuses mainly on curricular issues (instead of real pedagogical issues)". Basic requirements need to be taken into account in order to allow pedagogical innovations to take place with introducing ICT as a complementary not as a replacing tool in classroom education. Finding the right balance between student-centred and teacher-centred pedagogical approaches remains is mentioned as an area which needs to be furthermore explored. In cluster 2 projects (Towards a learning economy) the need to look at "competence building" issues in organisations and institutions are stressed. Pedagogical innovation is partly addressed from a learner-centred view, looking at the potentials of technologies to support effective learning and the development of new competences. Interactive approaches are considered to be very effective in theses terms. Communities of practice ensure collaboration among teachers for the pedagogical design and the focus on organisation related outcomes. Finally, cluster 4 project SYPREDEM (Synergy between Practitioner's needs and opportunities, research orientations and decision making on the usage of ICT in primary and secondary education) did not study any pedagogical innovation in terms of techniques, methods or devices. Innovations are mainly identified as experiential and R&D based approaches (focussing on teacher and R&D communities and the relation to the implementation of innovation) but with no direct indications on pedagogical consequences.

IST projects with little contribution to the pedagogical dimension of innovation are K2, TRIAL SOLUTIONS and CUBER. K2 as a supporting cluster of eLearning projects was not yet at the stage to present the results from the projects and will need

further consideration at a later phase. Although not taken into consideration due to a high amount of interpretation needed, pedagogical implications can be identified from the TRIAL SOLUTIONS project. Although not directly addressed (the project followed a more learning content-centred approach), developed tools fit well in the CSCL agenda, supporting learning processes by personalising learning units (material) and enabling students to individually share structured and annotated materials. KITS is focussing on knowledge management issues. Pedagogical innovation is addressed by investigating on adequate concepts for "teaching" conceptual knowledge based on knowledge management and discovery learning. Techniques, methods are devices are introduced by a game (KN Quest™) where learners interact in a simulated company and learn to "run" the business by introducing them to knowledge management procedures and possibilities for interventions. However, simulation as such, as a tool for innovative pedagogical approaches has not been addressed. The project TIMETOLEARN suggests that a "mix and match" of learning methods can lead to more effective learning but some methods will need further investigations since they have been considered yet at a very limited level. Methods were little insight is given so far are identified for argumentation tools, virtual reality and active worlds. Exploratory, collaborative, simulation based, drill and practice and self-guided learning approaches have been analysed. Some of the methods have been identified as more applicable, others as less applicable. However, documents analysed do not represent yet the stage where clear indications are given for innovation in pedagogy. Needs analysis is mainly based on identifying strengths and weaknesses of technologies in the company context of learning. Although given identified methods no analysis was made on the adequateness of such methods in relation to improving learning.

More consideration of pedagogical innovation was given from the ITCOLE project and its focus on computer-supported collaborative learning (CSCL). Since there is no unifying theoretical framework, there is a wide range of methodological approaches in this field as a consequence, which is also influenced by cultural diversity. The progressive inquiry model (new knowledge is not simply assimilated but constructed through solving problems of understanding is introduced as a model for children who can be guided to engage in extended processes of question- and explanation-driven inquiry and extended collaboration which may facilitate advancement of inquiry. Although positive experiences made in diverse country groups with applying concepts of collaboration, new challenges for teachers were identified as well which mainly relate to the efforts needed to moderate/facilitate the process of learning. Collaborative approaches were identified as well successful for sharing ideas and experiences among teachers, which also implies new approaches suggested for teacher training.

WEBLABS is focussing as well on collaborative approaches. In order to design educationally powerful activities through which students aged 10-14 years explore diverse knowledge domains a pedagogical setting has been designed in order to introduce and test various IT tools supporting interaction in groups. Experiences justifying an innovative way of teaching and learning are not published yet and will need further consideration in the near future. The project is about to finish in 2005. The same applies to the MOBILLEARN project which is about to finish in the end of 2004. Emphasis is given here on rapid communications and access to resources and to promote a just-in-time learning approach. Here, the innovative dimension can be

defined (a) by the degree to which the contents are adequate to support the learning process and (b) by the pedagogical models to be designed (or adapted) and applied to integration of mobile devices into the educational setting. The success still needs to be evaluated, but good potentials are identified for diverse target groups such as users from the corporate sector with little time availability for attending training measures and the need for immediate problem solving in flexible settings.

In general, with respect to new pedagogical approaches collaborative learning remains a crucial issue to be further on explored in the future from different perspectives, taking into account organisational aspects on co-operation and collaboration as well as pedagogical, including staff development and pedagogical work in networked educational settings. Experiences are needed demonstrating sustainable results and concepts of good practice, analysed in a multi-cultural/European educational settings and based on different technological approaches. As some cases show, use of information technology in education and training can result in increased flexibility between working life and study by bringing learning opportunities to the work place and by bringing working life closer to school. A prerequisite of open learning systems is, however, that various educational institutions, libraries and other information sources, as well as industry and commerce begin to perceive education from the viewpoint of lifelong learning. This requires collaboration and networking between the various parties.

3.2. Synthesis of Institutional/organisational changes as a result of ICT and e-Learning implementation

Institutional/organisational changes as a result of ICT and e-Learning implementation

The adoption of innovations in consisting institutions is not escalating because of a trend, but rather for the new possibilities and requests, the marketplace is offering. If institutions are willing or not to implement ICT depends on the constructive effects it can offer to the organisation. As stated in the analysis of the ICT and IHP projects, these effects have a wide range and significant consequences on the operational frameworks of the single institutions. Not to mention, that the introduction of innovations always comes along with changes and correspondently with risks. Anyhow, the passage toward a "learning organisation" is vital for every sustainable institution. More than ever, in the actual stage, extensive learning abilities are required, because of the increasing globalisation, spreading interconnections, the rising flexibility and the incessant innovations. These factors are all linked to the tangible knowledge-based economy and mirrored in the "learning organisation", such as in the innovative behaviours of productive organisations and of governments and public bodies at European, national, regional, and local levels. Indisputable is, that the transformation of the European economy requires increasing abilities to innovate, to adapt and to change, so as a wide re-thinking of institutions and organisations that constitute the knowledge infrastructure. There will be no one single type of organisational adaptability; rather, competence-building strategies will be increasingly diverse.

Research indicates that in the emerging economic context, the best-placed organisations will be those able to adopt the learning organisation vision at different levels. A close relationship between firms and other organisations is shown to be very important. The European model of learning organisation is seen as rooted in a system of intense learning interconnections among all the actors of the new economic context. Citizens, students and workers must be able to collaborate and share knowledge.

The main institutional changes that occurred within the analysed projects confirmed, that innovation is a culturally driven process, with the need for change in people but also within the whole learning structure. The direct effects on the work spaces concerned the reduction of the 'time to performance', enabling workers to be more effective, adaptable and employable, by reducing the time needed for their training without compromising on the effectiveness and quality of training. A further purpose that appeared clearly was the enhancement of the capacity in handling knowledge as the reduction of expenses of knowledge administration. The altering of the whole cost structure of the activity that takes place in the work spaces is a process optimisation and one of the most essential innovations returned by implementation of the new medias.

Staff training

There has been a transfer control of services and resources from the professionals of education to managers from the business field. This has involved a major restructuring of the professional culture, working practices, college management styles and conditions of service, including the employment conditions of the teaching staff. In order to take advantage of the existing technologies, skilled users are required

to adopt them correctly, but other then the most common ICT skills which are mostly self trained or learned from colleagues, the implementation of platforms or distinctive hard- and software, necessitates, according to the requirements, an intensive training of the lecturers and staff members. Unfortunately, in the majority of cases, the Universities and their executives, so as the most companies' staff, do not have enough personal experience with this new technologies and the use of this technologies in teaching. Mostly it is not enough to just electronically display materials, but it requires a didactical scenario and setting where E-Learning is used. Therefore, teachers and professors moreover need the appropriate skills and competences to plan these scenarios.
The new teaching approach comes together with a compulsory course redesign or enrichment while staff training is facing a process of pedagogical and didactical re-engineering. Teaching increasingly inclines toward coaching with the expectations of motivating and encouraging students, preparing and giving feedbacks, listening to problems and hinting solutions. Traditional lecturing will always remain important, but for sure teaching will become less standardised and more individualised.
This claim can be supplied only by bringing lectures and teachers back to learning what on the other part requires a personal belief in the new applications.
Lecturers who teach in the front line depends from their knowledge, but also on the infrastructure, given that new technical facilities have to be installed etc. This also means that for the lecturer the element of uncertainty through technical devices and new technologies is growing. Consequently a carefully integration of the technologies in an array of existing didactic tools is as important as the sensibly induction of new information.

Main actors, adopters and resisters

From the analysed projects resulted, that the interested persons are more likely adopters of innovations than resisters. But it is definitive, that the staff and the students, besides being the most common and fervent adopters of innovations, can be as well potential resisters. When habits are heavily changed, the initial enthusiasm often tends to disappear, and especially for students, who are accustomed to traditional methods it results difficult to change their learning practices. So it comes, that teachers often have the role of agents of change, with the prerequisite of the support of all educational actors, including that of the policy makers.
Especially in the case of educational institutions the support of the policy makers is often a main resistor to the innovations, as there is an overemphasis on instrumentalism and notions of "market readiness". An insufficient attention to wide general education and deficits to the particular personal/social development needs at educational and social level, could guide to a damage of the learning audience.
A new political economy of schooling, based on competition, is leading to increase class and sectoral inequalities as funding arrangements change in some systems to be more school competitive and market sensitive. Such modern technological aids as IT and autonomous learning become increasingly important within educational sectors without compensating resource allocation spread equitably.
Resisting factors to innovation are factors that are intrinsic to the educational traditions – practices, assessment and accreditation, but a missing believe in the benefit of this technologies, coming along with the lack of experience, is the driving force for a fraction of the target group to refuse the adoptions. Unfortunately this distrust is confirmed in one of the analysed projects as researcher made the tangible

hypothesis, that institutions that want to compete in a increasingly competitive international market prefer that potential students visit the institutions web-site rather than a general portal in which all courses are supposed to attract equal visibility. Consequently, the most competitive institutions will pay less attention to open portals than to their own

Enclosed, a good overview, owe to the analysis of the "Sypredem" cluster, about the major restistors in introducing innovation in schools:

- *School culture:* Schools often do not consider ICTs-related teaching/learning innovations as an important part of their mission or an important requirement of the teachers' profession.

- *School curriculum and timetable*: Regular curriculum demands tend to be inflexible and leave little room for innovation and change. The schools' timetables often leave little time for experiments that diverge from the mainstream instruction.

- *Schools' classroom arrangements:* Traditional classrooms which encourage frontal teaching, the placing of all the available ICTs in a separate computer lab and the lack of informal learning spaces in schools are all conditions that may become barriers to innovative efforts.

- *Schools' administration:* The administration of the schools, although initially enthusiastic, didn't take practical measures to relieve the teachers' involved from regular everyday school tasks and to engage the whole school community into the innovations introduced.

- *School staff roles:* The staff of schools often does not include teachers who are responsible for departments or who can manage activities for the whole school community. The formal rules for appointing teachers to co-ordinating roles within the school are very strict and school participation in an experimental project (even if approved by the school authorities) is not a sufficient condition.

- *Colleagues:* The review of the SYPREDEM cluster projects' documentation and the Workshop indicates that the teachers who were involved in innovation did not receive much help form less motivated colleagues in the implementation of innovation activities and the dissemination of their results within the local school community.

- *Parents:* Reported in the clustered projects were instances where parents opposed to the innovation introduced exactly because it was novel (i.e. to what they assumed their children were supposed to do and learn in the school that the teachers who were involved in innovation did not receive much help form less motivated colleagues in the implementation of innovation activities and the dissemination of their results within the local school community.

Organisational conditions

A qualitative research made in the course of one of the analysed projects, indicated the difficulties and the different dynamics of change and of innovation in different institutional systems. The relationship of the State to schools – in for example, the increase in school autonomy that has occurred in some systems (e.g., the UK) making them more responsive to both state (in effectiveness audits) and market pressures. School autonomy is by the way an institutional condition that appears to be rather supportive to innovation. Organisational inflexibility and lack of vision are among the conditions that prevent the rapid adaptability that is considered necessary in the learning society / learning economy. Moreover, a high level of knowledge exchanges cannot be maintained in a purely competitive economy, nor one focused only on technology rather than the people who engage in, participate in, and constitute technologies and economies.
At the same time increasing managerial control within the school reduces the autonomy of the professional role of teachers, creating countervailing pressures. This dominant school ethos towards collaborative learning and collaboration among colleagues (which are closely related to institutional as well as organisational practices) also appears to be a crucial factor.
Needless to say, lack of ICT infrastructure is fundamentally limiting the prospects for ICT based innovation to diffuse in schools.
Organisations, that already have an existing learning system and a substantial database of information in various forms, already have the ideal foil for modify from a centre of Learning to a "learning organisation".

Cost effectiveness

Educational effectiveness is fundamental, but since it takes many different resources to implement the new standards, the financial aspect often constrains the wanted objective. As mentioned, the educational and as well profit institutions, are moving toward a more cost-effective policy due to the increasing competition and the missing founds on the part of the higher bodies. The return of investment is gaining importance and synchronously getting harder to reach because of the high initial capital invested in the new technologies.
A needs assessment study, encountered in one of the analysed projects, reports that about one-third of companies do not think ICT based training is appropriate for them; however, almost all say they will probably invest in it in the future. There is high interest in reducing the cost of the initial investment in technological applications. In general, the price of ICT based learning compares favourably with traditional training, and many organisations believe their training budgets will increase in the future as part of global trends. The study shows that organisations highly value flexibility and consider it an important factor for investing in ICT.
Together with the implementation comes up the need of modifying or creating enhanced or new study programs. Universities and other educational institutions could save cost by sharing and re-use courses material and documentation. This option is often bounded by the high competition.
An interesting cost reductive approach has been developed by the "Trial-Solution" project in reference on existing high-quality materials. "It can be cost efficient by performing the structuring of the material only to such an extent as is necessary to

achieve the intended added value for the customer. Given the actual financial constraints, this implies that the parts of a document that are likely to be re-used by others will be fine structured, whereas little effort will be spent on structuring the parts that are of less value. This flexibility gives the possibility to handle several books within a single project".
The return of assets often has a medium to long-term character and is often difficult to quantify and therefore requires an accurate strategic planning.

Flexibility

Flexibility is a keyword for the whole ICT development and requires not only developed tools for a more flexible use of pre-arranged materials, but also supported flexibility on the institutional level. Students are no longer restricted to analogue materials in their libraries but additionally have access to the same information through online licenses. Students may structure their learning process according to their individual needs. Materials are more easily accessible to both teachers and students, which leads to high flexibility
A more flexible model of operation has to be well thought-out, with flexibility staying for flexibility in the access to learning experiences, both in terms oft time and space, but also flexibility in terms of the variety of learning activities, of approaches to evaluation, and of learning context.
The majority of the analysed projects fulfilled the expectations of flexibility, since they have not just been accomplished, but because the outcomes are still active, continuously updated and shared. In order to maintain the high level of disposition cluster projects as DELPHI emerged.

Accessibility

ICT has innovated our daily live in respect of access to knowledge, outstandingly considering the web accessibility. The Internet, with its capacity to obtain information independently from location and time revolutionized every aspect in our existence allowing a huge step forward in view of globalisation. Considering education it is now possible to get in touch with different teaching approaches even from different cultures and sharing information is no more a frontier. An auxiliary effect of globalisation and the cultural changes taking place is the growing economic profit aspect for both, private and public sector. In the first instance, the educational institutions are undergoing a phase of reformation, comprehending an essential course redesign or enrichment while the staff training is facing a process of pedagogical and didactical re-engineering. Due to the high cost of this reorganisation and to the growing competition in between the various institutions, the will to let other organisations partake the expensively acquired knowledge is consequently decreasing and so is their accessibility.

The incorrect arranging of the existing and emerging knowledge is leading to an torrent of badly manageable information with more and more people working on the same "construction site". Fortunately a great extent of clusters and pools is emerging with the ambition of collecting and sharing knowledge

3.3 Socio-economic aspects of the innovations in European Projects

Socio-economical issues

The analyses reveal that there is a strong concern regarding our ability to handle the new knowledge society and the fact that digital and mobile technologies are transforming the ways knowledge is constructed and utilized. This concern is explicitly addressed in the analyses of ITCOLE, IHP3, WEBLABS and MOBILEARN:

> According to the ITCOLE project, a widely experienced concern in western societies is how it is possible to prepare future generations to cope with cognitive, social, and motivational challenges of the emerging knowledge based society. An educational challenge emerging from the knowledge society is the need to train citizens to use tools such as computers, information networks, multimedia, and virtual reality applications that constitute the most concretely visible part of the knowledge society. The skills of using the new technology and searching of new information (i.e., basic information skills) are not enough; people need more advanced skills for acquiring knowledge, and using it meaningfully in different contexts. The latter are more general in nature and are closely related to collaboration, information processing, and communication. [ITCOLE]

> This project grows out of the assumption that the learning economy / learning society theory will become the leading idea for the European economy / society and, therefore, new ideas about learning will be needed. An overall learning imperative for Europe has been identified by European researchers in the last few years. The vast set of research studies coordinated by B.A. Lundvall, within EC-sponsored TSER and Fifth Framework programmes, provides a solid theoretical framework for positioning the learning organisation concepts and tools in the dynamics of the learning economy. This project attempts to analyse and synthesise the available research focusing primarily on the concepts of the learning organisation, knowledge and competencies, and the role of ICT with an aim of identifying needed priorities, strategies, policies, and areas for further action and research. [IHP3]

> WEBLABS is predicated on the belief that digital technologies are transforming the ways knowledge is constructed, how it is represented and how it is shared. New communities are formed during the project run, in which the firm distinctions between learners and teachers, between the knowledgeable and the ignorant, are blurred. The following points are major important factors in the project:

> - learners are challenged to think about how systems operate
> - digital technologies are exploited for the acquisition of personally engaging knowledge
> - the potential of the web is harnessed for collaborative construction. [WEBLABS]

> MOBILearn asserts international relevance through the conception, population, experimentation and exploitation of new models of learning and information use via next generation mobile networks through:
>
> a) creation of **pedagogical paradigms** to support learning in mobile environments – collaborative learning, organisational learning, dynamic knowledge creation in a group.
> b) **new architectural layouts** to support creation brokerage, tracking et al of learning and information contents on the mobile network thus extending existing systems
> c) selection & **adaptation of existing eLearning contents** for mobile devices enabling automatic multi channel and multi device versioning
> d) realisation of **new business models** based in existing success cases (DoCoMO, iMode) for self sustainability & deployment of the conceived solutions beyond the research timeframe within Europe's Knowledge Society framework for the third Millennium.
>
> All the above are considered to imply flexibility applicable within diverse global, national and regional environments. [MOBILEARN]

But the IHP analysis points out that innovation in education is a complex issue and that its potential influence on a socio-economic level depends on numerous factors:

> The project takes the position that there is not a linear relationship between changes in the socio-economic level, the development of new ICTs, or the development of new scientific knowledge and the transformation of the above into innovative educational services, processes or products. "The process of innovation in education and training is complex not only in terms of what factors may trigger such innovations but also in terms of the diversity of requirements (resources, institutional and organisational arrangements, people, school culture etc) that are needed to be met for educational innovation to take place and diffuse. Important aspects of these factors and requirements are affected by national educational policies against the background of national educational patrimonies in Europe." (p. 27) [IHP4]

According to the Time2Learn analysis there is a trend towards integrated solutions that provide courses with value added services such as needs assessment, online mentoring and performance support. The analysis also indicates that content is becoming more important and that collaboration among partners could improve quality.

> What is evident in both Europe and North America is the realization of what is needed on the eLearning front and their effort to accommodate these demands. The learner is moving away from stand-alone courses and is now demanding integrated eLearning solutions with value added services like needs assessment, online mentoring, performance support, etc. The use of brokering platforms is now more evident as the web enables the delivery of information, performance support, knowledge bases and record keeping. Content is becoming more and more important, thus many companies are cooperating with producers, vendors and portals, and this ensures high quality. More and more companies cooperate

> and consult on how to make the most of the new media options and how to implement the solutions most effectively. Delivery of off-the-shelf content to linking content to organizational competencies tries to answer to the question of how to move from a course-delivery model to matching learning and information-support objects to career competencies and performance-management systems. [Time2learn]

E-learning standards: consequences decisions problems reflections

The importance of the e-merging e-learning standards is addressed by several of the projects. The analysis of the MOBILEARN project especially focuses on e-standards. The project includes comprehensive information about the most common standards and standardization bodies. The following quotes show that the project aligns itself to recommendations for standardization, but that there is a need for definitions and clarifications of concepts and terminology.

> This MOBILEARN very clearly aligns itself to recommendations for standardization coming from a variety of sources and which include the following international standards and interoperability specifications organisations: ISO/IEC JTC1/SC36: ADL SCORM: CEN/ISSS WSLT: IEEE LTSC: IMS Global Learning Consortium: W3C: ITU: DCMI Education Working Group: Consensus creation fora. The project identified the following technologies and standards as key: XML, DVB-MHP, 3GPP and SIP. Great detail is given of the entities MOBILEARN identifies with as this seems a significant ”innovative” aspect of the project in addition to extended PDA use in education and training environments. [MOBILEARN]

> Recent growth of products for learning, education and training based on information technology in different countries leads to the use of different names for the same or similar concepts. This problem is exacerbated by the use of the same name being utilized as term for different concepts and their definitions. The need for interoperability and interchange for the products and components for learning, education and training requires a unified way for specifying, identifying and referencing these concepts and products, their features and components, by means of using a common terminology (ref: European Committee for Standardisation) [MOBILEARN]

The analysis of the MOBILEARN project also points out the entities that are involved in standardization are massive users of e-learning. From this one may infer that these entities have realized that they may benefit from the standards.

> The institutions and organizations involved in the standardization of E-learning technologies are typically North American or European entities, both public and private, that massively use software products, and specifically educational software. [MOBILEARN]

The TRIAL and CUBER analyses reveal a focus on standardization of learning objects. The TRIAL project emphasizes that learning objects are reusable across national and subject borders and that this also encourages cooperation. The CUBER project has even developed a detailed description model for learning objects.

> By supporting the re-use of learning objects across national and subject boundaries, the new technology helps learners to appreciate values produced within other settings. It promotes a new way of thinking that views the learner's subject and activity embedded in an environment of related fields and individuals. This will not only enable synergetic effects but also encourage cooperation and tolerance. The project will accelerate the emergence of new media in learning and education. It will take up and support the demand of user-friendliness for the information society, especially in the field of learning and education materials, in a new way. The project will provide new tools and services for high-quality learning and education materials in several scientific disciplines (cf. PW). [TRIAL]
>
> The Trial-Solution project is not restricted to geographical regions, although national and regional aspects (e.g. languages) have been included in the project. The project will contribute significantly to a standardisation and uniformity of the description of semantic modules of documents. This will guarantee the interoperability and the openness of the learning and teaching materials that have been developed within the project (cf. PW). [TRIAL]
>
> E-learning standards, especially the LOM standard, is essential for the CUBER-project and its description model. In the paper "Enabling Virtual Student Mobility through CUBER", Krämer explains it this way:
>
> > CUBER's description model consists of a *conceptual model* and a *meta ontology* (Pelto-Aho et al., 2002). The conceptual model defines the essential concepts of the subject domain together with their attributes and relationships. The most important concepts in the conceptual model are the central elements in the CUBER system, *programme*, *package*, *course* and *material*. As an example, some of the main concepts and their relationships are depicted in Fig. 2 (all attributes have been omitted for the sake of clarity).
> >
> > The meta ontology captures the definition of all the concepts in the conceptual model. This ontology is an application profile of LOM (IEEE, 2002) suitable for describing a range of educational objects including study materials, courses, course packages, and study programs. The pedagogical features of an educational object, its contents, special target groups, timing and location constraints, technical requirements of e-learning courses and other features can be described with the help of the CUBER metadata schema. (Krämer, Enabling Virtual Student Mobility through CUBER) [CUBER]

The ITCOLE project did not directly target e-learning standards, but the analysis included an interesting statement maintaining that the open-source movement has the potential to contribute significantly to the establishment of standards.

> The ITCOLE project did not directly target to the development of e-learning standards in the strict sense of the term. However, it offers valuable insights in the design, development and validation of CSCL environments. Synergeia and particularly FLE3 are offering good examples of CSCL environments and because they are offered for free and also are open-source they have the potential to contribute greatly to the establishment of standards in the field. [ITCOLE]

However, the KITS analysis maintains that there also are negative experiences and missing initiatives in standardization of areas such as simulation and games. Further, MOBILEARN points out that there are language and cultural diversity that should be taken into the standards considerations.

> A simulation game as an e-learning method is far from being standardized. Negative experiences in the past and missing initiatives have made, that this sort of implementations are still at the beginning. As positive experiences will surface, the methodology could easily develop into a standard tool for further education. [KITS]

> Localisation and internationalisation initiatives aim to ensure that standards consider language and cultural diversity in order to improve provision of technology based learning experiences. [MOBILEARN]

The K2, IHP2 and IHP4 analyzes did not provide further information about standardization issues:

> No relevant information found on this issue. [IHP2]
> Not suitable. [K2]
> No reference is made [IHP4]

Globalization: consequences decisions problems reflections and actions

The analyses recognize the importance of globalization and address it in several ways. The IHP3 analysis recognizes globalization as one of the key factors driving the new European learning economy and the CUBER-project claims to be based on the spirit of the Bologna Declaration's objectives regarding educational mobility and cooperation between European universities:

> Globalization is one of the key factors driving the new European learning economy / learning society. In the "globalising learning economy" approach, guidelines for a new "integrated competence building" system are needed; competences will be conceived from the viewpoint of their exchange value and also their use value. [IHP3]

> The CUBER-project is based on the spirit of the Bologna Declaration's objectives regarding educational mobility and cooperation between European universities. The CUBER Search Engine is freely available on the Internet, and it provides information about 518 courses: 4 in Dutch, 23 in English, 39 in Finnish, 142 in French, 274 in German, and 36 in Spanish. [CUBER]

> The Bologna Declaration, globalization and international harmonization of education influence standardization and course brokering. [CUBER]

However, the analyses seem to indicate that the projects focus mostly on issues such as access to global information and cultural exchange. One may argue that these issues are important and ubiquitous. However, except from the fact that all projects are organized and funded as European projects, few of the analyses really show

strategic commitment or heavy involvement in globalization. Globalization was most often discussed in general terms as shown in the analyses of K2 and KITS:

> As customary for globalisation, K2 favours a faster, cheaper, and more ubiquitous connection to information by clustering and forwarding the outcomes of a large number of e-learning projects. This social process, in which the geographical on social and cultural arrangements retreat, is essential for the collaboration, on a particular subject, by different nations, especially in between the European Union. [K2]

> Knowledge and cultural exchange as part of the phenomenon of globalisation is an essential subject for organizations. Since the barriers among countries are declining, to get in touch with the management approaches from different cultures, is nearly imperative. One of KITS concern was not to focus on a particular national thinking, but to assemble the necessary information from and for different nationalities. [KITS]

The WEBLABS, Time2learn and MOBILEARN projects are concerned with Europe's competitiveness and the North American leading edge. The analyses suggests that it is necessary to provide Europeans with the skills to compete in a global economy, to disseminate project findings, and provide content in several European languages:

> The project mentions the brain drain to the United States as one reason for their efforts. The project team thinks that it is necessary to provide young Europeans (who are also willing to stay in Europe) with the necessary skills to compete in a globalised economy. Furthermore WEBLABS takes into account the need for a broad dissemination approach and intends to disseminate project deliverables to the US as well: Two members of the coordinating partner will visit the USA approximately once per year in order to present the results of the project to an international (including US) audience at the annual AERA conference. [WEBLABS]

> America has gained ground compared to Europe and this due to common cooperation between the states and businesses. One advantage America has over Europe is the language. Europe is divided among 11 main languages, thus any content should be developed accordingly, while America surpasses all language barriers and can concentrate on the development of eLearning applications. [Time2learn]

> MOBILearn is a clearly intended as a high-impact European-wide project in terms of the partnership, that is international (partners coming from nine EU countries and countries outside EU, including the USA and Australia) and multi-sector (mobile operators of four countries, leading European software production companies, world-class mobile devices manufacturers, market analysis consultants, publishers and content providers). MOBILearn views its role as assisting Europe to retain its leadership, because, operating in new emerging fields/markets (post PCs), it builds on sectors where Europe is also well positioned (that is in rich content and service provisioning and Mobile and Wireless technologies). [MOBILEARN]

The ITCOLE analysis revealed that there are important differences among European countries and institutions with regard to issues such as educational systems, available infrastructures, learning processes, and socio-technical contexts. These differences may introduce many challenges for international collaboration:

> According to the ITCOLE project differences in the education systems among the participating countries, as well as differences in available infrastructure and teachers' and students' background on collaborative learning and technology influenced, directly or indirectly, the learning processes during the project. The first two phases provided very valuable and interesting information concerning implementation of ITCOLE software in diverse cultural and socio-technological contexts. In Finland, the technical possibilities and the teachers' initial level of expertise were more advanced. Also, the training and support of the teachers in Finland got a great deal of resources, because the training organisation of Helsinki City was also a partner in ITCOLE project, and this was seen in the teachers' advancement in their pedagogical thinking and practices. In all of the other test sites, the researchers collaborated with the teachers directly, and the teachers reported that they would have needed more training and more collaboration with the pedagogical researchers. In Italy, the teachers were also quite experienced, but the technical infrastructure was relatively weak. In Greece and the Netherlands, the teachers were much more novices both in terms of pedagogical expertise and skills and practices of using ICT. Consequently, the researchers reported substantial difficulties in finding the common theoretical ground for the pedagogical approach in Greece. In the Netherlands, the researchers were unsuccessful to motivate teachers to participate to the ITCOLE testing. [ITCOLE]

There are also other barriers towards globalization of e-learning. The Time2Learn project identifies the following European barriers: language barriers, privacy laws and privacy regulations:

> Europe's main challenge is the language barrier that call for native-language content development for local companies unwilling to adopt English. Another issue, which involves privacy law, is how countries can exchange information on an international level. Europe has strong labor laws that can interfere with sharing employee skills data across borders. American developed LMS systems in Germany have had to disable learner-skills tracking functions to conform to German laws. Furthermore, the European Union has privacy regulations that could hinder implementation of LMS systems. What has been identified as the most important characteristic of eLearning and what countries should focus upon are access to information, quality of content and in the delivery systems, assessment capabilities and certification opportunities. The most important focus though will be on knowledge, skills and training. The new learner is a "consumer" of knowledge available worldwide, anytime and anywhere. [Time2learn]

The WEBLABS project handled the language barrier by implementing an integrated mechanism in the ToonTalk platform, which changes the text language to match the language in which ToonTalk is running:

> WEBLABS identifies different languages of project partners as a major barrier. Therefore the project team designs and implements a mechanism (which itself is inspectable) integrated into the ToonTalk platform, which changes the language in which a text is displayed to match the language in which ToonTalk is running. This enables readability across countries of a) mechanisms which are built from pre-built pieces (each of which has its own mechanism) and b) new mechanisms which have been translated (perhaps by teachers). WEBLABS uses text-to-speech translation to allow the descriptions to be spoken as well as translated. [WEBLABS]

Further, the ITCOLE project points out the necessity to contextualize solutions to national learning patrimonies:

> Although CSCL is an issue which attracts the international interest, the ITCOLE project research reveals that CSCL solutions need to be contextualized within the national learning patrimonies. This is because across countries there is a great variation in the "maturity" of supportive systemic conditions and factors which affect the way CSCL is conceptualized and implemented. [ITCOLE]

The analyzes of IHP2 and IHP4 did not provide further information about globalization issues:

> No relevant information found on this issue. [IHP2]
> N.A. (yet implied by the discussion on socio-cultural change and its implication to educational sphere. Please refer to the section on socio-economic aspects). [IHP4]

Funding and commercialization

All analyzed projects have been funded by EU, and this funding seems to be crucial to the analyzed projects.

> The K2 project is part-funded by the EU. [K2]

> The fact that this cluster project included 16 projects with EU-funding shows that funding is available for support of educational ICT projects related to equity and social exclusion. The Delphi researcher hypothesize though, that it is hard to commercialize initiatives that is targeting social exclusion since the target groups often are minorities with little purchasing power. [IHP2]

The analyses were not able to identify any successful commercialization of the projects. On the contrary, they show that the projects seem to be rather vague regarding commercialization. Typical statements used are: aiming at establishing, not founded any organization yet, struggling to get additional funding, additional information about commercialization is not described, expects that it will be possible for the commercial partner to exploit the home market, consider launching etc.

> Funding: It is presented as an obstacle to the effective implementation of ICT-based innovation. Commercialization: N.A. [IHP4]

> According to Dr. Krämer, the project is aiming at establishing a CUBER consortium. They have however not founded any organisation yet. They are still struggling to get additional funding for a CUBE trial project. [CUBER]
>
> The KITS project is part-funded by the EU. In order to support the further development of KM Quest™ the partners decided to commercialise the product. Additional information about the commercialisation of the game, as the ones mentioned in chapter 3.7, are not described. [KITS]
>
> The commercial partner of WEBLABS is involved throughout the project, but at the beginning of month 24, will begin to ensure that the evolution of the project in its final year proceeds in such a way as to maximise effective exploitation. The project does not want to restrict exploitation plans to schools alone: the project team expects that it will be possible for the commercial partner to exploit the home market to a considerable extent. Furthermore the partners consider launching a consultancy and advice service based on the results of WEBLABS to support the further dissemination and exploitation of the Commission's investment. [WEBLABS]
>
> According to the project's Final Report the technology is ready for application in various fields, which may, however, require adaptation and downsizing of the available tools for more specific purposes. Moreover it is assumed that further progress requires applications in cooperation with experts in other domains and the further exploration of various business models which must be tailored to the specific market situation. [TRIAL]

But, it is also interesting, and potentially beneficial for EU, to observe that some of the projects intend to provide free products and services. ITCOLE and WEBLABS especially mention free online environments, free collection of web activities, tasks, and case studies, as well as free runtime version of all software:

> The issue of commercialization of the Synergeia and FLE3 are non relevant as both on-line environments are offered for free. [ITCOLE]
>
> During the final year of the project, it is planned, that the commercial partner of WEBLABS will begin to shape the outcomes of the project, in terms of ensuring that deliverables are in a suitable form for subsequent commercial exploitation. Therefore WEBLABS intends to make a collection of web activities, tasks, case studies available freely on the web, and to package the full set with the platform which will be required to modify and extend the deliverables. This means that a free runtime version of all software and subsets of supporting documentation will be available. In order to obtain full functionality for the materials users will need to purchase the platform. Thus the WEBLABS materials will add value to an existing commercial product, in ways which will improve its commercial and educational potential. [WEBLABS]

The TRIAL project maintains that the non-existence of generally accepted online micro-payment systems is a major obstacle for the commercial exploitation. The project also advocates individual and campus licenses for online access to electronic books.

The further development of XML technology, E-learning and electronic micro-payment systems are the factors which are most likely to facilitate the future exploitation of the results of the Trial-Solution Project (D15). [TRIAL]

Trial-Solution is a project funded by the EU as part of its Information Society Technologies Programme (IST), which is a major theme of research and technological development within the EU's Fifth RTD Framework Programme (cf. PW).

A major obstacle for the commercial exploitation of the technology is the non-existence of generally accepted online micro-payment systems. Such systems would be necessary for a pay-per-use business model.

According to the Final Report (D15) it seems currently most promising however to market campus licenses, eventually with the option to convert a certain number of campus licenses into full licenses. This model was also used in the Trial-Solution evaluation phase. It is in-line with the preference expressed by the students of paying for the service through the university, eventually as part of a tuition fee.

In this license model, currently established by Deutsch and SIT for the Gellrich series, the printed books are sold independently of the online versions and contain a one-page advert pointing readers to the server containing the sliced versions (currently at SIT: http://www.slicing-infotech.de/en/index.php). Users can purchase individual or campus licenses for online access to the sliced books for one year. The price of the licenses should be well below the price of the printed book in order to stimulate interest. Such costs should be attractive to those who, in the course of their studies, need perhaps only part of the book content and for only a particular period of time. The benefits to the users are those of having the complete content of the book in electronic form without having to purchase the printed product. So the user can search through the text and select the parts currently required, making use of the complete knowledge management system bound within the delivery tool. In addition, users have the chance to expand the offer by combining the Gellrich books with others on offer via SIT.

The main benefit for the publisher is the further marketing opportunity in addition to that of the printed book. The publisher has the chance to use the same content to win a new, younger target audience, who may not be able to purchase the print item. The hosting service also has an advantage here in that they function as an agent and receive payment for their services preparation and hosting of the data, license sales, and so on. This payment could take the form of a share of the license sales (D15). [TRIAL]

Implications for LLL

In the analysis of IH3 it is succinctly stated that Life Long Learning plays a key role in the formation of a new European learning society. The TRIAL analysis emphasizes the constant need for change in people’s work and general life.

> The definition of the learning economy / learning society implies that all aspects of society and culture will have a learning component. Consequently, Life Long Learning plays a key role in the formation of a new European learning economy / learning society because the need for constant rapid adaptation is making it necessary to learn throughout life in many scenarios outside traditional formal education. [IHP3]
>
> Life long learning is a concept which takes into account the constant changes challenging our working life and life in general. The Trial-Solution project can be seen as supportive to this concept because the tools developed may help to gather and select information which is relevant according to the personal situation. Individual aspects may be easily highlighted and focused on, while at the same time irrelevant or already studied knowledge can be neglected. [TRIAL]

Regarding training of older workers, the final IHP2 report claims that ICT could provide strong learning incentives for both younger and older workers, but that older workers could face particular problems in the area. ICT can create stimulating and motivating opportunities for learning, but it can have a negative impact on workers who may feel that the technology deprives them of control:

> The introduction of new information and communication technologies (ICT) provides the strongest learning incentives. This holds for both younger and older workers (Tikkanen et al., 2001). Though older workers could face particular problems in this area, given that they have not become acquainted with these technologies during their initial education and training and that their own work experience might be less relevant for this area, the results of the WORKTOW project show a differentiated picture in this area as well. First, the actual use of ICT in daily work is not that much related to age, but to economic sector, organisational restructuring and educational background of workers (with the higher educated making more use of ICT). Secondly, irrespective of age, ICT can create stimulating and motivating opportunities for learning, though as indicated before, it can have a negative impact as well in the case it deprives workers of the feeling of being in control of their own work. Thirdly, the findings indicate that overall older workers appeared to manage the ICT challenges quite well, acquiring the necessary ICT skills while working. In this context, Tikkanen et al. (2001) conclude that the fear that older workers will be disadvantaged by the rapid introduction of new ICT might appear to be overestimated within a period of five to ten years, certainly if learning methods are developed that better match the learning skills and styles of older workers. This expectation appears to be corroborated by the conclusion of Van der Sanden et al., (2002) that there is no longer evidence for the feared 'digital divide' in relation to age. In addition to this, the WORKTOW project found evidence that workers 'share' ICT competences, in the sense that they try to plan and disperse work activities in such a way, that those workers that are good in particular tasks (e.g. using particular software) take these on board, while others take care of work tasks they are good in. (Page 103-104) [IHP2]

Other issues related to Life Long Learning are flexibility for learners, virtual mobility, development of communities of learners, collaborative knowledge-building, and teachers' professional development schemes:

> Learners have to be able to decide on learning needs and to choose a preferred way of teaching themselves. Gaming combined with a subjective support is a new option and depending on the results, it could betimes become standard in many organisations. [KITS]

> Provision of European course portals and acceptance of Learning Object Metadata will support virtual mobility of students since they more easy can find information about study options available to them. [CUBER]

> The wider involvement of teachers in the ITCOLE project and the training they received, as well as the design and implementation of school-based projects offered them the opportunity for professional development. The innovations introduced have many implications for the development of life-long-learning practices among teachers, particularly through the development of communities of learners and collaborative knowledge-building. [ITCOLE]

> The issue was not dealt with in any systematic way. However it is implied that appropriately structured approaches to the introduction/integration of ICT-based innovation in schools requires appropriate teachers' professional development schemes which in turn affect their implementation for LLL. Implied is also that teachers professional development is a LLL process. [IHP4]

The K2 and WEBLAB analyzes did not provide further information about the implications for Life Long Learning.

Chapter 4: Indicators of Change

There are no significant changes in the scope and nature of the indicators emerging from the twelve projects analysed as compared to those of the Minerva projects. The indicators offer an insight into the innovative uses of ICT in learning and, specifically, into the more relevant characteristics that are present in the projects analysed.

4.1. Pedagogical factors affecting learning in ICT learning environments. Critical indicators

Teacher and student roles

Depending on the technologies applied and the learning strategy, the roles vary. Changes in the teaching roles have been linked with applications in ICT that can support constructivist and socio-cultural approaches to learning. The role of the teacher as a tutor observing the actions and promoting the exchanges among the students is, again, mentioned. Teachers as collaborators, facilitators, supporters, coordinators, scaffolds and/or guides of students' work and learning are among other, the roles more present. Other teacher's roles mentioned are player in a learning game and team member.

Approaches and scenarios to e-Learning

Some envision e-learning as the system that allows for the distribution of learning materials on the Web, or delivers web-based learning, or provides communication services for the learning community.

A broader approach relates e-Learning with activities where innovators integrate existing or new ICT-based teaching/learning products, pedagogic theories and/or institutional and/or organisational strategies and plans into existing educational activities or new activities and/or contexts (new forms of teaching/learning activities or new educational activity settings) which result in improvements in teaching/learning processes and their outcomes.

With respect to scenarios, a typical e-Learning scenario is best characterized as *virtual mobility of students*, a scenario in which course providers can easily disseminate information about their courses while students can easily find information about courses that suit their interests and needs. A more evolved scenario would be that of providing bro*ckerage educational services*, in which several institutions join efforts for offering educational services and courses.

A similar scenario would be the *market model* for e-Learning in which training companies determine customer needs more precisely and offer training services. The goal is, through ICT, to reduce the 'performance time' of learners, enabling them to be more effective, adaptable and employable. There is a need to focus on competence building in a dynamic network of organisations and institutions as a challenge for E&T systems.

A different e-learning scenario would be that of user-tailored CSCL environments for integration into regular teaching under the so-called mixed mode learning. Virtual communities of learning is a typical example.

A broader approach is to considering e-learning as a *productivity tool for teachers and students*: in preparing their lectures, teachers combine various materials from their current research activities together with other used in former lectures and with documentation selected from the Web and reprocessed. The students, on the other hand, are able to pick out information they need, also able to create their individual learning materials. Rapid communications among actors and access to resources are also key.

Teaching and learning methods, and devices

Some e-learning projects use combinations of teaching/learning techniques, ranging from the more traditional ones (expository learning) to others with a more active role of the learner (experiential learning, discovery learning, etc). For instance, the combination of expository and discovery learning, together with game scenarios simulating real experiences is an example of this. Learning approaches close to the content scenarios (eg. knowledge management models) are also mentioned, which offer a closer match between the learning contents and the real scenarios. In these models, online learning tools allow for a rich exchange or simulation of learning interactions.

The socio-cognitive model places the active learner at the heart of activities, with learner control and with learners making decisions that match their own cognitive states and needs: learning takes place in a social context and the forming and reforming of concepts need not only take place at the level of the individual; collaborative group work and sharing with peers and others can be a significant way of confronting one's own conceptions and pre-conceptions, contributing to the perceived need to restructure one's cognitive schemas.

The Activity Theory is becoming also present in e-learning. This approach encourages users to consider and reflect on the range and benefits of their existing activities before being thinking about how those activities could be enhanced by new learning technologies and services.

As with respect to the discussion on who is the key actor of the learning process, in online learning, the balance between a student-centred approach and a teacher-centred approach remains an unresolved issue, not in the least due to the fact that the discussions on this topic have been focused too much on self-learning as a replacement for teaching. More recently this tendency appears to have been reversed and the debate is now more focusing on the complementarities of both approaches, or on the dichotomy individualisation versus personalisation of learning.

Five different categories of integrating technology into learning have been described—exploratory, collaborative, simulation based, drill and practice, and self-learning.

In the category of *exploratory learning* there is quite high expertise, especially in direct instruction. In the category of *collaborative learning* there is higher expertise in asynchronous methods than the synchronous ones, especially concerning the use of e-mail and discussion forums. In the category of *simulation based learning,* there is more experimental usage than high expertise, when applicable. However, the methods in this category are mainly inapplicable for a large number of groups. In the category of *drill and practice learning*, the results show that R&D groups are experts or frequent users of methods that support self-assessment and problem solving tasks. In the category of *self-learning*, there is high expertise with the exception of inquiry learning, which is basically inapplicable.

Overall, pedagogic innovation is a little developed aspect of innovations in education and training. The question is how ICT promotes new didactical approaches. In general the methods that emerge most successfully are those based on more established ICT tools. For instance, asynchronous tools supporting CSCL are quite successful. Unfortunately, some methods have not yet been explored. This might be explained thusly: a) some methods have been applied only to very specific subject domains - such as *law for argumentation*; b) they demand a lot of resources and high technical expertise of personnel; and, c) the results from evaluation studies of the learning effectiveness of the application of these methods might not have been promising.

Teacher/students interaction

Interactions are rich when students play an active role. For instance, in learning games, student-student interactions are rich; there are briefing and debriefing sessions in which all, teachers and students, participate. The interactions can be designed in a very detailed way, linked to the roles of the learners. However it is important to say that these roles might be applicable only for certain ages, not necessarily for all.

Through the new communication and interaction technologies, there are new possibilities for communication and interaction between students, between students and teachers, and between actors within the educational system and those outside of it (in museums, companies, schools, governments, etc.). ICT creates numerous opportunities for interactive approaches where students have to react or interact—providing feedback, making choices, and introducing different pathways tuned to differences in styles and prior knowledge.

Students may share their personalised materials and thus are able to acquire knowledge collaboratively. Students can also import materials selected by their teacher and adapt the selection further.

It is well recognised that ICT tools, both synchronous and asynchronous, facilitate interactions among learning actors, either sharing the classroom or spreading along different sites. Video conferencing, e-mail and the web create social and educational links: learning about each other, negotiation, co-construction of reports, etc., necessitate rich interactions among students and among students and teachers. Building a community, as the project envisages it, involves helping to provide an ‘infrastructure of engagement’ that should include facilities of mutuality, competence and continuity.

Teacher workload

It is widely recognised that the workload required from teachers to make effective use of ICT is considerably higher than the one that they are facing in their regular everyday school practice. However, there are exceptions: once teachers engage regularly in the preparation of teaching materials with ICT, the teacher workload decreases.

Teacher collaboration

Teacher collaboration is an important part of the communities of practice. Teacher collaboration is also necessary for creating quality educational materials, lessons, etc. Staff have the opportunity to work collaboratively and closely with colleagues who are spread around geographically disparate teams.

Assessment

There are tensions between traditional curricula and assessment procedures developed prior to the introduction of ICTs and the open, skills-based, student based approaches supported by ICTs.

For instance, assignments that have been collaboratively produced need new assessment methods. Individual and group conversations, tasks-based interviews, etc., are assessment methods mentioned. Developing digital portfolios in which students and teachers can bring together experiences, assessments, feedback and reflections that are related to competence building is becoming more and more prevalent.

4.2 Institutional/organisational changes as a result of ICT and e-learning implementation

Institutional changes resulted from the use of ICT into existing structures

The institutional context is an important factor affecting the use and implementation of ICT.

In the wider context, there has been a transfer of control of services and resources from the professionals of education to managers from the business field. This has involved a major restructuring of the professional culture, working practices, college management styles and conditions of service, including the employment conditions of the teaching staff.

One example is the growing concept “learning organisation,” which is being developed to represent innovative behaviours both of productive organisations and of governments and public bodies at European, national, regional, and local levels in a phase in which different aspects linked to the knowledge-based economy, require extensive learning abilities in every kind of organisation. The importance of ICT both

as a tool and as an end in itself in supporting the restructuring of organisations is widely recognised.

The integration of ICT implies change and that its use within education and training is basically a culturally driven process with the need for change in people and within the whole learning organisation.

Staff training

Staff training cannot be limited to the use of the ICT in context, but to the production of learning materials (handbooks, guidelines, etc.). Raising the capacity of the teacher population to use basic ICT applications is but a minimum requirement to ensure that effective ICT-related teaching/learning innovations will have a reasonable chance to get diffused in the body of education.

Main actors, adopters and resisters to the adoption of the innovation as identified in the project

Identified in most of the projects, below is a list of common problem areas in conducting innovation in schools:

- School curriculum and time table
- Schools' classroom arrangements
- Schools' administration
- School staff roles
- School culture
- Colleagues
- Parents

Flexibility

Flexibility guarantees the take-up of innovations within diverse global, national and regional environments.

At the microlevel, the use of ICTs has created the need for school administrators to introduce flexible timetables that would allow for interdisciplinary teaching and learning, project-based school work, collaboration among teachers and among schools, informal learning, on-the-job teacher training, and involvement of out-of-school experts and the local community.

Accessibility

Access depends on the strategy of the innovation. In all cases, it is necessary to increase accessibility by making information about courses and services easier to find and identify.

Accessibility awareness would improve the quality of e-learning for all students, but it is of special importance to students with disabilities. The Delphi research points out

that there is a long tradition for using ICT and online education for making education and learning more accessible for people with disabilities.

4.3 Other socio-Economic aspects of the innovations

E-learning standards

Recent growth of products for learning, education and training based on ICT in different countries had led to the use of different names for the same or similar concepts. Interoperability and interchange for the products and components for learning, education and training require a unified way of specifying, identifying and referencing tconcepts and products, their features and components, by means of a common terminology.

E-learning requires standards: design of a suitable metadata standard that fits the needs of all the innovations while respecting existing standards. There are several international standards and interoperability specifications organisations: ISO/IEC JTC1/SC36, ADL SCORM, CEN/ISSS WSLT, IEEE LTSC, IMS Global Learning Consortium, W3C, ITU, DCMI Education Working Group, Consensus creation fora, and LOM.

Standardisation has other advantages: by supporting the re-use of learning objects across national and subject boundaries, ICT helps learners to appreciate work produced within other settings and promotes a new way of thinking in an environment of related fields and individuals.

Localisation and internationalisation initiatives aim to ensure that standards consider language and cultural diversity in order to improve provision of technology based learning experiences.

However, not everything can be standardised; for instance, an ICT-based simulation game as an e-learning method is far from being standardized. Standardisation should not diminish the possibilities to innovate teaching and learning methods.

Globalisation

Globalisation and international competition go together. Globalisation trends and consequences are present in all education and training sectors.

In the university sector, the trend towards Web-based learning models and technology defines new conditions for universities, in terms of finances, staff qualifications, and staff time. To serve the changing needs of the networked world, European universities need to cooperate in order to reduce costs while responding to the growing demand.

Another example is that of the so-called “new economy” which has brought many structural changes that have profound implications for industry, occupations, competition, and the dynamics of the individual worker. There is a pressing need for companies to be more competitive, while maintaining a high quality of service and

performance. There is an urgent need to make the current training systems more available, effective, accurate, and flexible in order to enable true training on-demand services for the individuals and their work-organizations. The competitive challenge is to reduce the time needed to train people for the jobs of tomorrow, to improve workers' current knowledge base and expertise (promoting "integrated competence building" system, and most importantly, to make this practice of professional development a continuous one.

The learner is moving away from stand-alone courses and is now demanding integrated eLearning solutions with value added services such needs assessment, online mentoring, performance support, etc. The use of brokering platforms is now more evident as the web enables the delivery of information, performance support, knowledge bases and record keeping.

Content is becoming more and more important, thus many companies are cooperating with producers, vendors and portals to ensure high quality.

Other socio-cultural factors influencing learning processes

The Bologna Declaration, globalization, and international harmonization of education influence standardization and course brokering.

Equality and social exclusion in society as a whole: the following groups at risk were listed: Low skilled, ethnic minorities, older workers, unemployed, re-entrants (often female), and SMEs.

Some projects identify different languages of project partners as a major barrier. Europe has eleven main languages, thus any content should be developed accordingly, while other countries, such as the US, have no language barriers and can concentrate on the development of eLearning applications.

Funding & commercialisation

A way to go to the market with e-learning materials is to make a collection of web activities, tasks, and case studies freely available, and to package the full set with the platform that will be required to modify and extend the deliverables. This means that a free runtime version of all software and subsets of supporting documentation should be available. In order to obtain full functionality for the materials users will need to purchase the platform.

Implications for LLL

The introduction of ICT provides the strongest learning incentives. This holds for both younger and older workers.

Provision of European course portals and acceptance of Learning Object Metadata will support virtual mobility of students due to the fact that they more easily find information about study options available to them. The provision through web-based services can be seen as supportive of lifelong learning because these tools may help to gather and select information that is relevant according to the personal situation.

Among the barriers for participation in lifelong learning are those related to returns on investment in training and learning. The returns on training investments often have a medium to long-term character. In addition, returns on such investments are very difficult to quantify.

The actual use of ICT in daily work is not related to age so much as to the economic and educational background of the learners (the higher educated learners make more use of ICT). Irrespective of age, ICT can create stimulating and motivating opportunities for learning, though it can have a negative impact as well when it deprives workers of the feeling of being in control of their own work. Overall, adult people appear to manage the ICT challenges quite well, acquiring the necessary ICT skills while working.

4.4 What was considered innovative?

- the adoption of a learning scenario built from a game with an improved pedagogical process obtained by adding instructional support.

- focus on developing and using Learning Object Metadata in a Portal comprising a search engine, a knowledge base, and a authoring interface for international providers of courses and programs.

- a novel technology for content management based on the slicing of documents into semantically meaningful objects; automated composition of personalized books for specific scenarios.

- not simply sharing knowledge, but collaboratively building knowledge expressed through diverse media.

- the provision of a uniform communication mechanism for a wide range of purposes, including communication between program fragments, collaborative exchange by students of working models and messages, and distributed programming interfacing to and from tangibles.

4.5 What was the role of ICT in the innovations?

Information and communication technologies were a fundamental factor for all the projects. Here are some examples:

- ICT as key for communication, e.g., team support done through the Internet.

- ICT plays a key role on the reconceptualization of the relation between learning content and activity structuring, as well as on the reconsideration of the schools' organization and the delivery of services.

- ICT as a means for the support of active engagement of students; e.g., by learning programming in a game-like way.

4.6 Were the innovations studied sustainable/scalable?

Little has been found with respect to these important factors linked to innovation. The connection between sustainability and commercialisation has been mentioned, but it is the exception. Commercialisation would strengthen the sustainability of innovations while allowing a continuous development of the outcomes.

Another factor mentioned is that re-utilising existing content adds to the possibilities of sustainability.

Scalability is barely mentioned in the projects analysed. However, it seems that, when mentioned, scalability of the projects seems to be easier to achieve than sustainability of the innovations. Many projects result on micro-innovations, with little chance to survive given the restricted budgets for these provisions and their low level of institutionalisation.

The examples of schools are paradigmatic: though practitioners participate actively (even enthusiastically) in the activities, the extent to which research outputs are sustained by the participating teachers in their daily practices appears to be rather low if the institution is involved, rather than an individual classroom or teacher. Also, within schools a great barrier to the sustainability and diffusion of effective ICT-related teaching/learning innovations is, in general, the lack of reforms that would target the integration of ICTs across school curricula.

Chapter 5. Concluding commentary

5.1 Policy context for the review

The policy context of this review is located within the general targets for an *eEurope* set by the Lisbon Summit (June 2000) which posited that the European Union must become the most competitive knowledge-based economy with improved employment and social cohesion in the world by 2010. Vigorous educational strategies of member states were perceived as vital components in achieving this aim. The eEurope 2005 Rolling Action Plan (Barcelona 2002) has succeeded the *eEurope 2002 Action Plan,* endorsed by the Feira European Council in June 2000 and its aim to carry forward the Lisbon vision is based on two groups of actions, which reinforce each other. It aims to stimulate services, applications and content, covering both online public services and e-business on the one hand and on the other it addresses the underlying broadband infrastructure and security matters. It puts emphasis,

> *"on the widespread availability and use of broadband networks throughout the Union by 2005 and the development of Internet Protocol IPv6 ... and the security of networks and information, eGovernment, eLearning, eHealth and eBusiness"*[3]

There is recognition of the need to stimulate services and infrastructure to create the dynamic where one side develops from the growth of the other: an area of tasks predominantly designated for the private sector. On the demand side actions on e-government, e-health, e-learning and e-business are designed to foster the development of new services. Public authorities, in addition to providing both better and cheaper services to citizens, are held to use their purchasing power to aggregate demand and provide a crucial pull for new networks. More specifically, with relevance to learning, education and training, eEurope 2005 actions are underpinned by the notion that it is for education authorities in each member state to develop the skills of its citizens through education and lifelong learning but the Europe-wide "eLearning" initiative promotes new online ways of learning through and across the EU. Implicit in this latter orientation is the need for the rapid adaptation of existing structures and *"ways of doing things*" to the use of diverse multimedia platforms that future technological convergence in combination with broadband enabled communication offers. The eEurope 2002 vision concretised within eEurope 2005 essentially asserts a notion of eLiving and a seamless movement between sectors, of which education and training activities, within a lifelong learning paradigm, are crucial components. The ongoing policy context reminds us that education, training, learning are long term processes but the speed of proliferation of technological innovations creates difficulties in achieving the degree of distance needed to consider and reflect upon the organisational, social and cultural dimensions of these innovations. The reviewed projects have therefore to be considered within a landscape that is constantly moving, deepening and becoming more complex.

[3] http://ue.eu.int/Info/eurocouncil/index.htm

5.2 The review approach

In the Introduction to this report, the structure is described as allowing the reader to become acquainted with the reviewed, analysed and synthesised case projects which have been contextualised within an **area** perspective rather than a sectoral one. The areas offered are:

- pedagogical
- institutional
- cross-cultural/socio-economic

Within these areas particular focus has been located in respect of the identification of

- methodological trends
- issues related to learning scenarios
- gender perspectives to ICT Assisted Learning
- socio- economic variables affecting/affected by ICT Assisted Learning.

The review which has been made of a range of IST projects (8) and IHP clusters (4) and their outputs, however, seems to indicate a number of deficits in the DELPHI process which need some comment. In terms of the stated focus above there is no evidence or analysis presented of, "*gender perspectives to ICT Assisted Learning*" either among this set of projects nor is evident in the conclusions of the synthesis of the review of MINERVA projects. This "*focus*" was not presented within the guiding headings of the template used. Consequently no conclusions can be drawn. In view of the significant literature in this field and the existence of numerous projects relating to this problematic, it might be useful to consider amendments to the our framework analysis.

Another problem arises in attempting to aggregate outcomes and/or outcomes in progress (where projects are mid term and/or unfinished in terms of a final report) of projects flowing from EU programmes which intrinsically adopted different methodologies and expected outcomes. IHP flows from the legacy ring fencing of European social sciences research whereas IST, notwithstanding its inclusion of horizontal socio-economic dimensions, was not per se about research but application4. A key objective of the IST programme has been to ensure European leadership in the generic and applied technologies at the heart of the knowledge economy. This of course presents problems when attempting to adhere to the Delphi template.

Within the IHP clusters review programme, analyses were attempted of research activities which had little or no direct relevance to the explicit issues addressed by DELPHI which manifest themselves in the "template" of headings. This was particularly evident in IHP1 which with the exception of one project within the cluster (DELILAH: Designing and Evaluating Learning Innovations & Learning Applications) which addressed issues of new learning technologies within a socio-economic contextualization, cannot be said to have direct relevance to the specific

[4] Subsequent and current indications are that beyond Framework 6 differentiation of programmes such as these will disappear and a process of complex convergence is/will be taking place as solutions based methodologies are adopted.

issues addressed by DELPHI. However this single project (DELILAH) is also included for review in IHP Clusters 2 and 3 and its methodological approaches were incorporated into IHP Cluster 4 review. The significance of this project is in its presentation of a theoretical and methodological approach which attempts to put aside commonly held formulaic notions of success in ICT projects (e.g., the ideal ratio of computers to students or the ideal application of ICT in educational environments). Instead there is the suggestion that the relationship between outcomes is not predictive and linear but is the result of a complex process of interactivity among essential variables and how they develop over time. This, of course, is not unrecognised in the DELPHI approach but the lack of detailed sub indicators under the general headings presents difficulties which encourage generalised statements (often of intent) rather than evidence-based data on real effects and outcomes. The socio-economic review above, for example therefore, was constrained by the inappropriateness of the template checklist to allow a holistic analytic landscape to be constructed against which the reviewer could paint in the outcomes and characteristics of the reviewed projects. This in itself is actually a useful outcome as these initial reviews have pointed up the need for perhaps, further refinement of the original critical indicators as devised within the template.

A further point perhaps should be made which concerns the lack of "voice" of the user. This is not necessarily a deficit of the DELPHI approach but more probably reflects the distance from the user at which many projects operate. This is not something which can wholly be excused by offering unscientific "surveys" of user responses among other things, but may in fact reflect something more significant in terms of how practitioners and researchers actually view the students and users of their "innovations".

5.3 Comments on particular issues

The following are general comments which have been provoked by the analytical review of the projects.

5.3.1 Pedagogy

An overarching assumption attached to the implementation and development of elearning is that it offers entry to a process of renewal of pedagogic models. Active learning and socio-constructivist approaches operate widely as educational practices and can be seen within many of the projects directly concerned with innovative elearning. However uncritical and unreflective implementation of such approaches is fraught with risk and may not in some small measure be responsible for the difficulties many teachers have in happily using new technology. Training in technology use will clearly not solve this.

One way of classifying pedagogic approaches is along a parameter from the transmission of formal knowledge by voice or script at one extreme to learning by doing at the other. ICT-based e-learning can accommodate both of these, from serving as a channel for the exchange of lectures-notes and student essays at one extreme to providing a manual, for example, for mechanics or doctors who are working in real time on a real engine or a real patient at the other. However, the discourse of

constructivism which has arisen from school education is primarily focused on various levels of simulation or play. This discourse occupies the middle ground between the extremes on this parameter. While schoolchildren can write real poems or plant real plants, the middle ground is occupied by learning about things which are to some degree inaccessible for reasons of distance, safety or cost. Exposure to these phenomena means exposure to images, maps, models, and films, while participation means role-playing and simulation with some degree of unreality. ICT-based e-learning appears to offer the possibility of making available a wider range of such materials, at lower cost, with greater or more seamless integration and authenticity, and available anywhere and anytime through cyber-space.

It can be argued that there are two negative aspects of these opportunities. One is that access to this resource is channelled through a small screen and has to be constantly manipulated through a keyboard. The other is that the pedagogic methods of group work and dialogue which have been developed through the 20th century are disrupted by the isolation which fixation on the PC causes even when the members of the class are in the same room. In a European context this is revolutionary, although we should remember that in large parts of the world children and adults have also participated for a long time in distance learning through radio and postal and other services.

The projects examined, like most other e-learning materials and systems which have ever been developed, have generally arisen from an understanding of the potential value of ICT technologies to expand the scope and audience of existing educational systems and approaches. They have visualised this as an expansion of the classroom and a breaking down of the barriers between education and the wider world. They have eschewed the 'transmission' model but they have seen the pedagogic possibilities of e-learning in terms of a potentiation of the possibilities of the constructivist approach as a result of the greater powers of simulation and presentation available through ICTs. The communication potentials of ICTs have been used to add on tools for dialogue between teachers and students and among students in real time and through central data banks. There are three reasons for this basic limitation,

i. the need of the organisation to maintain control of the process
ii. the need to assess and grade students, and
iii. the power of the idea of the classroom as the basic model and therefore of the process as basically one of simulation of what cannot in reality be accommodated in the classroom.

The constructivist model arose at a time when there was what in retrospect seems to have been a surprising degree of consensus about the basic "furniture" of the universe. This seemed to offer the possibility of producing a standardised range of pedagogic material which would provide students with a realistic simulation of those parts of the universe which they for a variety of practical reasons could not directly access. In some pedagogic cultures this was to some extent supplemented by an emphasis on the need to develop critical thinking and independence of judgement. But, whereas we have several centuries of experience in developing critical thinking and independence of judgement in both humanistic and scientific education through traditional methods, we have no idea how these goals will be affected or effected by the plethora of information available through cyberspace or by the habits of thought fostered by using

it. Active learning takes place, but the designers of the system did not themselves learn in this way and thus have no real idea what it is that learners are learning.

The constructivist approach is not wrong in terms of using exposure to a wide range of materials to elicit active learning through a range of targeted interventions. A problem, however, arises not from any basic flaw in the pedagogic technique but from a lack of reflection on what representation and simulation really mean in a world without a basic consensus about the reality which is to be represented and simulated. There is a distinction to be made between fostering critical thinking and simply allowing all of the dissonance of the real world to be played out within the classroom. Opening up the classroom to the real world may be justifiable on a number of grounds but should not come about simply as a result of the economic and technological attractions of ICTs and cyberspace.

There is, on the one hand, a tendency to sell e-learning short by simply using it as a cheap medium to extend the penetration of the same old learning materials and approaches. On the other hand, the real results of this are incalculable because we do not know whether the same old things really are the same old things when they are learnt exclusively through a different medium. So the result is a mixture of unintended conservatism and unreflected, undirected change. This means that the development of ICT-based learning systems and e-learning is an excellent object for the study of evolutionary processes, i.e. non-teleological reproduction and adaptation with selective survival.

Conceptual and methodological investment made in the past and currently concerning these issues is of huge significance for practitioners. Such investment has borne results within open and distance learning, particularly at the tertiary level. At the level of school programmes there is a general consensus that developing the role of teachers and redefining school programmes within the new paradigms is progressing slowly. There is as yet no consensus on how to redefine school programmes. Some indications emerge from some of the reviewed projects that whereas training in tools remains predominant, there is yet an understanding that ICT use must be put into perspective in relation to teaching practices. Further, ICT use must be placed in context in relation to subject areas and the vigorous promotion of cross-curricular approaches. This reflects the notion that ICT use does indeed permit a rethink of traditional boundaries as many projects bridge subject or traditional areas. This implies that there is in some degree an understanding that the knowledge, skills and expertise required have to be known before considering the relevance of a tool, application or innovative approach.

There is an aspect of e-learning addressed by some projects which is different – learning how to use e-commerce, e-democracy, e-governance, e-health care information etc. In this case there is no simulation involved; one is simply learning how to use the real systems. However, as with the use of, for example, word processing, spreadsheets, databases and programming languages, there will probably be a demand for accreditation of skills, which in turn will lead to requirements to *'learn'* the less useful parts of these systems up to the same level as the really useful ones. On-line systems to simulate the real use of such systems and assess the user's skills in doing so will therefore develop alongside the 'real' hands-on learning of

actual users. Schools may find this useful in filling in reports, on among other things, student's civic participation.

5.3.2 Some Socio-cultural Aspects

The USA is the leading nation in the world of ICT and this is to a great extent due to its large home market which is almost entirely English speaking. The USA has a significant Spanish-speaking community but the members of this community who use ICTs are largely bilingual. The USA therefore can develop ICT products initially in English and satisfy the home market with access to global English-speaking communities, and can follow this by developing Spanish versions with equivalent global markets.

By contrast the EU is faced with the task of developing language-specific versions of educational software not just in the national languages but also in some other education-recognised languages. English and Spanish products face US competition in both the European and global markets while the global market for ICT products in French and Portuguese is currently relatively weak.

Opening the opportunities of e-learning to older people, reflecting the need to acknowledge the logic of current European demographics, is particularly problematic as they may not have English even as a second language. This means that the inclusion of much undigested English into the computer-speak of the national languages is itself a barrier to their participation.

Technical translation and educational translation and adaptation are expensive services while machine translation is still very inadequate. It is both expensive and inefficient to produce multiple versions of translations of operating systems. It therefore seems that a first step towards developing a European-wide e-learning culture would be the development of a standard vocabulary and phrase-book of operating and navigating instructions for e-learning systems. The Commission's Action Plan recognises this and that it is important not to develop technological solutions, software and contents in isolation from linguistic and cultural issues. A crucial aspect to the ease of availability and reading of information is in relation to meta-data and CEN and the standardisation bodies have identified the need for a focal point in Europe on Dublin Core metadata standardisation to be more generally applied. Some of the projects we have reviewed indicate an awareness of the complexities of the standardisation process but there is the feeling that more significant assistance should be given to projects on how to take full advantage of current developments. As noted below, the results of research and practitioner projects can be valuable to standardizers, and, conversely, these projects need to have state-of-the-art information on standards development programmes.

5.3.3 Technology and Standardization

The standards programme for eEurope will facilitate the adoption of the research results and provide feedback about their acceptance and problems in their use. There are close links between standardization and research. In the field of information and communication technologies, many of the projects deal with issues such as inter-operability of technologies, harmonisation of electronic communications and so on.

Project results clearly can be valuable to standardizers but conversely projects need to have state-of-the-art information on standards development programmes. This is essential in terms of sustainability and scalability potentials.

Many of the projects reflect an awareness of the need to locate innovative technology developments with applications and services in addressing socio-economic issues, which is more than adhering to the transversal requirements of the particular programmes from which they receive funding. The development of open standards and open source software to ensure interoperability of solutions and further innovation is clearly motivating some projects but this also serves to remind us again of the uneven development in implementaion and access that operates across the Community, for a variety of reasons. It is unclear at the present time what indications there are that the new technology wave imminent can be embedded within current institutional and organisational structures and as well deal with the need for new conceptual and methodological paradigms required in teaching and learning, referred to above.. It is worth reminding ourselves that rapid progress is underway in developing user friendly interfaces which are intuitive, can interpret all our senses such as speech, vision and touch and that understand our gestures and various languages which will be coupled with powerful and flexible knowledge technologies that are semantic-based and context-aware.

5.3.4 New Economic Models

Some general points need to be made here. Internet access costs, originally identified as a major hurdle are going down. The marginal costs of internet access for a PC owner have become smaller but remain significantly higher than in the USA: they are also much higher for broadband internet access. There appears to be no prospect of a feasible pay-as-you-go-per-use payment model for e-learning because there is no overall successful model of micro-payment on the internet. This constrains the possible models of financing of e-learning systems. They must either be free to the end user, sold as a complete package, or subsumed within some fee for a larger service.

The simplest model is free provision to the end user by the originator through their own web site. In this case continued financial support for some degree of promotion of the service would also usually be required to ensure take-up. If software is provided free to other organisations by the originator some degree of regulation to ensure that the service is passed on free to the end-user might be required. One area of possible growth in free-to-end-user e-learning may be the web sites of national employment services. Universities and other public bodies may make their stand-alone software freely available but will not be able to provide supported tutor-based, mentor-based or forum-style learning systems available on the same basis.

Commercialisation of e-learning services seems to require either that the e-learning is sold as a stand-alone package to the end user or that modules or instalments are sold to the providers of e-learning portals or more general multi-use portals who recover their costs by some combination of advertising and subscription charges.

The extreme fluidity of the market in web access portals will probably lead to the concentration of commercial e-learning in two kinds of service: provider portals such as America On-Line and Microsoft MSN on the one hand and specialist commercial HR companies on the other. The former would bundle the cost with their overall subscription or would regard it as a loss-leader to attract or keep market share. HR companies would need to target their market very precisely and/or integrate e-learning into personal development and firm-specific competency systems in order to keep their market share.

The developers of e-learning software and systems might consider these options at the very beginning of their project and some of our reviwed projects have clearly done so. If they envisage free-to-end-user delivery however, they should specify what kind of body will provide the ongoing support for hosting, accessing and promoting the service. If they envisage commercialisation they should specify whether they are aiming at schools and colleges, HR firms, or the general public, as individual purchasers or via portals, and they should be required to conduct targeted market research in line with these projections.

It is well illustrated within most of the reviewed projects that new cost analysis models are needed which would indicate with some surety the real costs of elearning for the benefit of policy makers, course providers, students and users. Whilst within open and distance learning there is a long tradition of costing underpinned by the desire to reach more learners, it has been noted that the educational climate is such that the cost efficiency of traditional classroom based education, traditional distance learning and the newer networked paradigms needs to be established. Costs are difficult to quantify as there is often disagreement about which costs should be taken into account, relaiable data is unavailable because it is not collected in a systematic manner, recorded costs are unstable and evolving and some data is perceived as confidential and may not be made publicly available. Ash and Bacsich have identified a significant barrier in addition that different and previous costing approaches use different vocabularies and these need to be standardised before they can be analysed. Costing activities have a central role in the planning and development of educational systems and so financial and costing schema needed to be partnered to planning documents for effectiveness and sustainability Across Europe there is little evidence in the literature that this is fully recognised. Ash and Bacsich suggest a three phase model and associated financial schema which includes a stakeholder dimension.

Planning & Development	*Developing/innovating an idea* *Writing up business/action plan* *Purchasing & evaluating existing material or developing your own*
Production & Delivery	*Curriculum delivery* *Progress monitoring* *Marking & feedback*
Evaluation & Maintenance	*Quality assurance exercises* *Replacement & updating of materials* *Evaluation against aims outlined in action/business plan*

Stakeholder dimension

Expenditure dimension	Institution	Student/User	Staff	Tota l
Staff Costs	*Salaries, wages, pensions etc*	*Opportunity cost of learning not earning*	*Opportunity cost of not doing a better job*	

Depreciation	*Buildings, computing provision*	*Own home computer and accessories*	*Own home computer and accessories*	
Expenses	*Subsistence, registration*	*IT consumables, connection charges*	*Expenses incurred*	
Overhead	*Software licences*	*Additional insurance*	*Additional energy requirements*	
Total				

Only some of the reviewed projects indicated full awareness of the need for new economic modelling for detailed cost analysis of various technology/pedagogy interfaces although it is clear that the development and implementation of automated courseware production systems, automated pedagogical advice systems and automated business systems can potentially deliver huge economies of scale and associated costs effectiveness.

5.4 Some recommendations

The learning society has been discussed by some in terms of innovation and competence building with social cohesion (Lundvall and Johnson). Innovation is viewed as the key process that characterises a knowledge economy when understood from a dynamic perspective while competence is the foundation from which innovation emerges and allows many innovations to be applied. Contributions occur to both the "generation" of innovations (on the supply side) and to the "utilisation" of innovations (on the consumption side). Learning is reflected in improved skills in people and in the generation, diffusion, application and usage of new ideas. Learning thus can be an unintended consequence of experience and augmentation of scale, as formalised at the single entity, regional or national level. Learning to manage a large portfolio of loosely unrelated knowledge accessing distributed knowledge and leveraging it all in a rapid and interconnected manner into new learning products and solutions is a major challenge. The knowledge base is becoming deeper in cognitive dimensions and much more complex and requires a diverse competence base not all internal to a specific entity. There is need for a diversification of actions to support the creation and diffusion of distributed knowledge bases. This is particularly appropriate in the context of the digital divide for catching up countries and regions so that growth and innovation spread will not just be based on the creation of new sectors but on the internal transformation of sectors that already exist – by exploiting their distributed knowledge bases through adequate incentives and institutions. With the co-evolution of technology and education and utilising what are the outcomes of our analyses it seems not inappropriate to recommend that new **development models** need to be defined which recognise that among their component parts are required

a) a radical redefinition and diversification of teaching methods and training of teachers
b) stronger understanding of how to create institutional strategies within educational entities and the skills to effect that
c) embedded effective cost analysis of technology/pedagogy interfaces
d) mechanisms that inform on state-of-the-art developments particularly in standardisation and generic education and training vocabularies

These component parts, as are any development models, are crucially dependent on shared knowledge and experience. This carries implications for the emergence of truly effective trans European "knowledge pools" and further for the design and processes through which researchers and practitioners seek support from funding entities to research, test and apply their innovative ideas.

ANNEXE

eEurope Targets 2001/2002

ACTIONS	ACTOR(S)date	PROGRESS MADE
Provide all schools, teachers and students with convenient access to the Internet and multimedia resources, where appropriate using the Structural Funds.	Member States **2001**	IST funds earmarked in action lines for "eLearning for European youth in a digital age" and "School of tomorrow". A study on measures to reduce cost of the educational use of the Internet is being launched within the eLearning initiative. Results are expected for March 2002. In some Member States Structural Funds will be used to contribute towards the objectives of connecting all schools to the Internet.
Connect schools progressively to the research networks, where appropriate using the Structural Funds.	Member States **2002**	The Cross Programme Action (eLearning for European youth in a digital age) in the IST Work Programme 2001 launched in June addresses some aspects (like the use of satellites, 3rd generation mobiles) that will support the progressive connection of schools to research networks. A proposal under negotiation addresses in particular context eLearning with broadband technologies.
Ensure availability of support services and educational resources on the Internet, as well as e-learning platforms, for teachers, pupils and parents (e.g. access for disadvantaged children, access to digitised cultural heritage, multilingual multimedia learning materials, European open source software initiative, collection of best practice). European Commission to support these efforts via the education, training and culture programmes and to provide adequate funding within IST Programme.	Member States European Commission **2002**	IST 2001 work programme contains 'eLearning for European youth in the digital age', 'eLearning futures' and 'bridging the IT gap through development of training infrastructures'. The SOCRATES 2001 call sets eLearning as a priority. Under the IST Committee a Working Party on Education and Training has been established which gives priority to the use of ICT in schools. Workshop on Open Source Software and eLearning was held in September 2001. The Commission financed the Support Service of PROMETEUS to promote Multimedia Access to Education and Training. PROMETEUS is intended to bridge the gap between research and actual use of learning technologies, content and services.
Provide training, using Structural Funds where appropriate, to all teachers, in particular adapt teacher curricula and offer incentives to teachers to actually use digital technologies in teaching. European Commission will ensure exchange of best practice and co-ordinate research efforts through its education, training and IST programmes.	Member States **2002**	Projects have been launched under the IST programme to identify and exchange best practices, recommendations & guidelines. Under the eLearning futures action line in 2001 the impact of new learning environments on teachers will be studied
Adapt school curricula to enable new ways of learning using information and communication technologies.	Member States **2002**	Projects launched under the IST & the education and training programmes to address the knowledge & skills required for the digital age
Ensure that all pupils have the possibility to be digitally literate by the time they leave school. European Commission to support pilot projects, exchange of best practice and co-ordinate research efforts, via its IST and education programmes.	Member States, European Commission **2002**	16 projects (~35 MEuro) have been launched/retained under the IST Programme supporting test beds, exchange of best practices, new learning tools and applications for pupils. This in particular through the "School of tomorrow" Action Line and the "eLearning for European youth in a digital age" Cross Programme Action.

eEUROPE Targets 2001: to provide all schools, teachers and students with convenient access to the Internet and multimedia resources where appropriate using the Structural Funds

BE	I- line (reducing internet access prices for schools, libraries and hospitals), Regional activities (PCKD
DE	Implementation through action in the 'Länder' and through Public-Private-Partnerships: 75% of all secondary schools are connected to the Internet; sponsoring of PC's for schools under www.initiatived21.de;free Internet access for teachers and pupils
DK	All educational establishments can connect to Sectornet, the majority with Government grants. By End 2000, all higher educational establishments, secondary schools, preparatory courses, vocational schools and about 75% of basic schools will be connected to Sectornet, and thus to the Internet. The majority of the schools have also established local networks. In connection with the project "IT, Media and Primary Schools", it has also been made possible for the remaining basic schools to connect to the Sectornet with Government grants.
EL	The OP "Information Society" is funding an action line ensuring that all Greek schools should have access to the Internet and multimedia resources, with adequate web -based support services, by end 2001.
ES	80 % primary schools connected. 95 % secondary schools connected.
F	L'équipement et l'accès aux réseaux du système scolaire français se poursuit à bon rythme. En mars 2000, on comptait ainsi - 250 000 ordinateurs dans les lycées, soit un pour 6 élèves ; - 180 000 ordinateurs dans les collèges, soit un pour 14,5 élèves ; - 215 000 ordinateurs dans le premier degré, soit un pour 25 élèves. Le ratio d'une machine pour 6 élèves atteint dans les lycées constitue probablement un optimum ou à tout le moins un pallier, relativement approprié aux usages pédagogiques actuels des technologies. L'accès à internet, dans des conditions qui permettent effectivement le développement d'usages pédagogiques, concernait en mars 2000, 98 % des lycées et 89 % des collèges ; il sera généralisé à la fin de l'année 2000. 30 % des écoles accèdaient à internet en mars 2000 ; la généralisation est programmée pour la rentrée de septembre 2002.
IT	The final funds from the Development Program for Educational Technologies 1997-2000, implemented by the Ministry of Education, are given to schools by the end of year 2000. The Program is divided in two major subprograms: A - Operational Units for teachers: equipment and training activities for teachers B - Multimedia in the classroom: equipment for the involvement of the students All 12,500 scholastic institutions are involved in both the subprograms listed. All the TIC are used within the Program, including digital Satellite apparatus, but multimedia personal computers and LAN are the main instrument. One of the objectives is Internet access for all the schools. The following table shows the number of scholastic institutions involved and the expenditures. Year Schools in the subprojects Expenditures A B (MM Euros) 1997 5320 1898 79 1998 5000 4020 133 1999 2984 1711 66 2000 = 5000 110 TOTAL 13304 12629 388 The situation at the end of the Development program: As the funds for each financial year are delivered to the schools only at the end of the same year, the full effects of the Program are achieved by the first semester of the following year. Consequently we can resume the final effects of the Program at the middle of 2001 (figures are estimated) **Multimedia Stations** PC/students ratio - 1/30 in the less equipped schools (elementary, lower secondary, classical lyceums) - 1/10 in the more well-equipped schools (Technical Institutes) - a total of 350.000 PC in the schools, of which 250.000 are multimedia PC. **Internet Connections** 100% of Technical upper secondaries 90% of non Technical upper secondaries 80% of lower secondaries and elementary **Teacher training** Within subprogram A 13,000 alphabetisation courses have been organised at school level, Other initiatives at school and local level have been activated within the normal funds for training or with the help of local administrations or private companies; Distance training initiatives have been launched. The main one is a course in partnership with the RAI broadcasting service. We can evaluate that more than half of the Italian teachers (about 500,000) have been involved in the training activities. **Structural funds** A large part of the structural fund are dedicated to multimedia programs. In particular, for extension of multimedia equipment for special needs, creation of a network within the school, creation of Local Multimedia Services Centres for schools and teachers. **Conclusion** Many of the 2001 objectives will be achieved by the middle of 2001. The actions for internet access are being intensified in many different ways to accomplish the objective of 100% of the schools on the Internet by the end of 2001.
IRL	Since the end of 1999 all Irish schools have an Internet connection. In the majority of cases this is a dialup connection over PSTN. 69% of post-primary schools have an ISDN connection while at first-level it is about 17%. This access has been provided through the Schools IT 2000 initiative, launched in November 1997, and in cooperation with the Information Age Schools initiative of Eircom. Schools IT 2000 involved a government

	expenditure of £40 million over the 3 year period 1998-2000. Eircom made available an additional £15.9 million (approx.) under the Information Age Schools Initiative. In response to the success of the programme to date, £75 million is being made available over the next number of years for a new and greatly expanded programme. This will concentrate, in the main, on such areas as high speed Internet access to classrooms, on-going training of teachers and curricular development and support.
LUX	The majority of the teachers have an individual access to the Internet via RESTENA, the NREN (national research and educational network). Students of the technical high school (IST) have an individual access via the NREN. Secondary schools students may use the existing Internet access in their schools. Establishment of an Internet site for the exchange of best practices for teachers of all levels Progressive introduction of a "computing driver's license" and an "Internet driver's license " for pupils Reduction of computer/pupil ratio from 1:12 (current situation) to 1:8 in the course of 2001 Outline of a programme for the equipment for schools with laptop computers (project " E Computer fir all Schüler ") during 2001 et 2002. Development of didactic material for computers and intense teacher training with a view to computer usage in all disciplines.
NL	Is part of the Dutch Action Plan “Education Online”: additional budget is made available to speed up roll-out of “Kennisnet” (a network to connect all schools to the Internet)
Aus	Extension of the Austrian School networks. Equipping school libraries with multimedia selections: internet connexions are generally available in school libraries. Federal schools 100% internet connections. There are currently negotiations with the Schools administrative bodies to achieve 100% connection for the provincial schools
PT	Through the Science, Technology and Society Network (RCTS) Internet connections were established in schools, libraries, teacher-training centres and other associated entities of a cultural, scientific and educational nature with the respective digital network infrastructure having been installed (RDIS).At this stage all schools from the 5th to the 12th grade are connected and approximately 40% of 1st to 4th grade primary schools (2500 of the 9000 existing) and 120 of the 200 existing teacher-training centres. Until the end of 2001 all state schools, teacher-training centres and public libraries will be connected through RCTS.
SF	More than 90% of schools have internet access
SV	The most important recent Swedish initiative is the Delegation for ICT in schools (ITiS). ITiS is both an IT project and a school development project. It covers all levels from pre-school through upper secondary school and all municipalities are invited to participate. The programme runs for three years starting in 1999. Examples of its components are: in-service training for 60,000 teachers; a multi-media computer for participating teachers; e-mail addresses for all teachers and pupils; support for developing the Swedish Schoolnet and the European Schoolnet and measures for pupils with special needs. One goal of the government is that all schools should be connected to the Internet. State grants are offered to improve the schools' accessibility to the Internet.
UK	On target to achieve this. 20,200 out of 22,908 schools now connected to the Internet - virtually all secondary schools [98%] and primary not far behind [86%]. ICT training has been made available to all teachers, and we are revising the National Curriculum to place a sharper emphasis on ICT. Priorities include: £700 million to improve the ICT infrastructure in schools, further and higher education; £230 million to improve ICT skill levels among educators; the establishment of City Learning Centres (Excellence in Cities programme, £100m for 1999-2002 CMF) in major city schools to meet the needs of pupils and adults in the community for connections, infrastructure, content and training (32 City Learning Centres in EiC target areas from September 2000 and a further 50 from September 2001); stimulating high-quality online educational content; working with the industry-led Digital Content Forum to introduce short-term ICT work placement programmes for 16+ students