Education and Training   **eLearning**

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Deliverable Title: **Report on New Methods to Learning in Technology- based Environments and Related Policy Matters: Synthesis of the Sectoral Reports**

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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 citizentry's Lifelong Learning endeavours. In principle the DELPHI Project aims to give responses / 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 on the knowledge generated by its sub-activities in the context of an Internet-based observatory on learning innovation. The above aims are to be 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 second deliverable and the intent behind its development is to report on the contribution of MINERVA projects to the understanding of new methods to learning in technology based environments and required policy steps implied. The specific tasks taken in the project and reported herewithin include:

Task 2.1: Selection of identified cases
Objectives: Selecting the relevant projects to be reviewed within the WP according to the project objectives.

Task 2.2: Analysis and synthesis of the final Reports of the projects.
Objectives: to critically Review projects' outcomes in order to provide a framework of preliminary categories, outlining their main outcomes initially in the following thematic areas: new learning methods using ICT, new learning skills and roles for teachers/trainers, new organisational issues.

Task 2.3: Synthesis of Policy Recommendations reports
Objectives: To synthesise recommendations out of the projects, according to their goals, in order to provide inputs to the following WPs.

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 second work package. All of the projects reviewed are MINERVA supported endeavours. The scope of this review is to

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

The subsequent project work aims at the investigation of IST and IHP supported projects. The review of recently completed projects of the three EC Programmes constitutes Stage 1 activity within DELPHI.

As indicated above this review process is undertaken in order to facilitate an analytical Theoretical Structure based on indicators of change. The project's second 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.

The Chapter that follows presents a brief discussion on e-learning under the scope of ICT based innovation in learning. The second chapter discusses the methodological approach followed in the attempt to depick key indicators of change. As stated above the bulk of this report is devoted to the description of the case projects reviewed under a sectoral perspective (chapter three). The fourth chapter discusses the results obtained from the review and analysis of the cases in terms of indicators and the report concludes with a preliminary set of recommendations for policy on e-learning from a pedagogical, functional, organizational and socio-cultural points of views.

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 below focuses more on parameters and factors related to INNOVATION (under various perspectives) rather than on those that constitute e-learning from a conventional point of view. In any case the latter is to be defined within the context of the DELPHI Project.

e-learning trends / ICT based innovation in learning

What are the major trends related to innovation and current practices relating to the implementation of ICT in education? WP1 of the DELPHI project intended to provide an overview on the state of the art by outlining the several dimensions which have to be taken into account such as a

- 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.

With respect to the DELPHI objectives the issues to be taken into account here are dealing with organisational (institutional), pedagogical and sociological/cross-cultural. 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.

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

Pedagogical issues	Organizational and institutional issues	Socio-economical issues
Bandwidth and rich media		
Other issues	Other issues	Other issues

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

Since it was assumed that the insights differs from research and practise, both perspectives are relevant for analysing projects according to the research questions posed within the scope of the DELPHI project objectives. 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 %	:	:

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

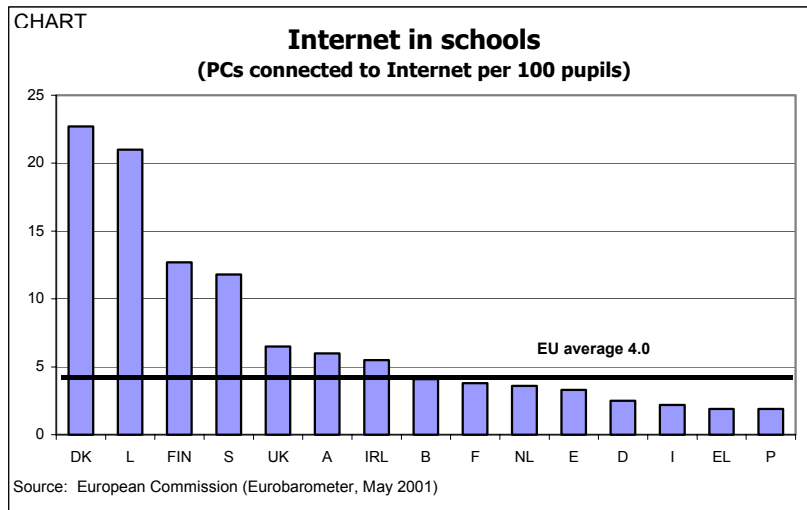|											
	:	:	:	:	:	:	:	:	(p)	:	:
Estonia	:	:	:	:	:	:	:	:	7,4% (p)	:	:
Latvia	:	:	:	:	:	:	:	:	6,3% (p)	:	:
Lithuania	:	:	:	:	:	:	:	:	6,5% (p)	:	:
Hungary	:	:	:	:	:	:	:	:	6,5% (p)	:	:
Poland	:	:	:	:	:	:	:	:	5,0% (p)	:	:
Romania	:	:	:	:	:	:	:	:	3,4% (p)	:	:
Slovenia	:	:	:	:	:	:	:	:	:	:	:
Slovakia	:	:	:	:	:	:	:	:	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|R APID&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/bench marking/benchmarking_en.doc] - a quite unbalanced situation is to be remarked among the European countries:

CHART

Internet in schools
(PCs connected to Internet per 100 pupils)

EU average 4.0

Source: European Commission (Eurobarometer, May 2001)

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.
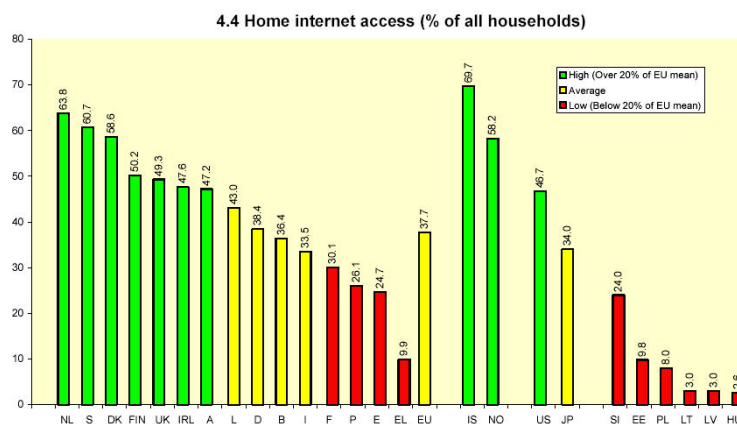

Sources: EUROSTAT/Eurobarometer; GSO survey for EE, HU and LV; years used: 2001 for all countries, except 2000 for JP, HU and LV.

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.

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[2] http://elearningeuropa.info

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)

1.3 Participation in life-long learning (% of 25 - 64 years age class)
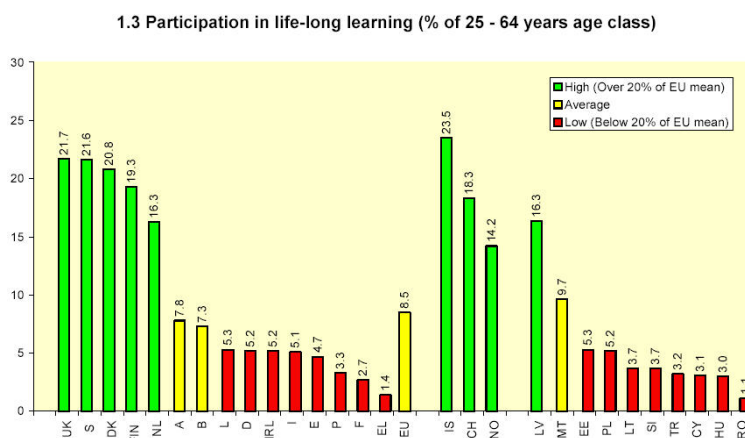
Sources: EUROSTAT, Labour Force Survey; GSO survey for CH, LV, MT and TR; years used: 2001 for all countries, except 2000 for CY, 1999 for CH, 1997 for A and IRL, and 1996 for TR.

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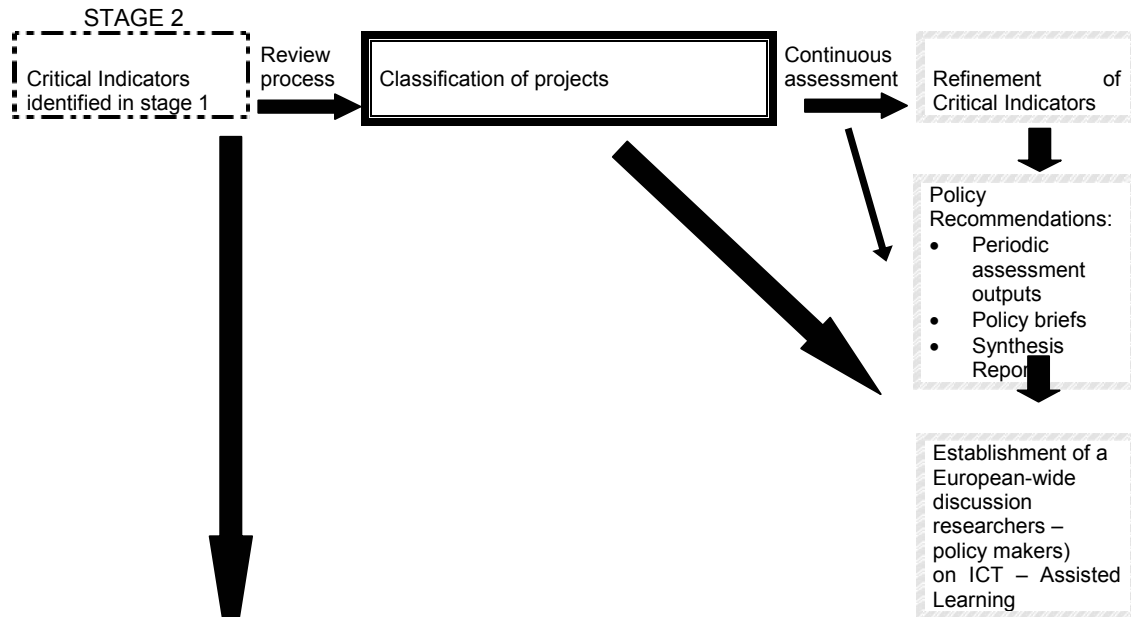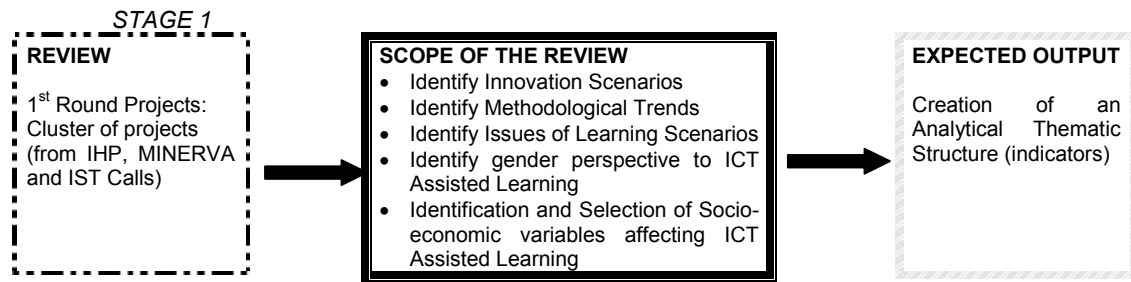
The review of different sets of projects is undertaken in order to identify similarities/differences and trends of socio-economic and pedagogical nature which will facilitate the formulation of indicators for the assessment and evaluation of on-going projects. A critical analysis will define the specific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

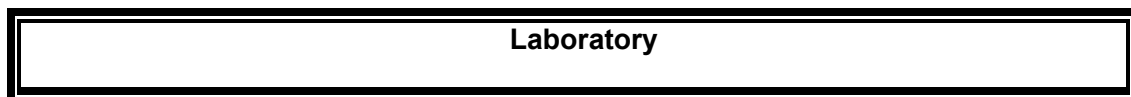The project set as a starting point a set of transversal research questions, those being

- 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?

The project is operationalised at several levels and 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 will constitute the frame under which the components of these projects will be critically assessed and evaluated. The Model has been selected amongst others due to its strength to identify policy implications at various levels of project activity and contexts. The details on the methodological approach are given in Section below. The different levels of work demonstrate the orientation towards research, implementation and exploitation/dissemination.

Level 1

STAGE 1

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┌ ─ ─ ─ ─ ─ ─ ─ ─ ┐
  REVIEW

  1st Round Projects:
  Cluster of projects
  (from IHP, MINERVA
  and IST Calls)
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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

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┌ ─ ─ ─ ─ ─ ─ ─ ┐
  Critical Indicators
  identified in stage 1
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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 MINERVA projects. The activities undertaken under the scope of the pre-selected dimensions and associated review parameters, as those were defined at the level of the proposal and enhanced with input from the project's review into the state of the art on e-learning, included:
- selection of education sectors
- selection of projects
- specification of review parameters

- design of instrumentation
- negotiations with projects
- review of project documentation
- drafting of case project reports
- drafting of sectoral reports
- review of commonalities / differences amongst the sectors
- reflective analysis of sectoral reports content for the identification of indicators mainly in the areas of learning methods where ICT is involved, new skills and roles for teachers / trainers and new organizational issues
- reflections on policy needs and drafting of recommendations.

As noted in the introduction MINERVA projects are reviewed in the project prior to the review of IHP and IST Programme projects as those were assumed due to the nature of the Programme these are supported from to be more pedagogical oriented and could therefore facilitate the identification of parameters that are required to investigate into the sets of the other Programme projects.

In this regard the work in WP2 drew input from the State of the Art Review Document and gives input to the subsequent workpackages in which the conclusions of this report will be validated and refined. Consequently, the results presented in the next chapter are rather preliminary and should be treated as such.

The manner by which the various tasks and subtasks were undertaken by the DELPHI Consortium for the reported activity is outlined herebelow:
- selection of sectors

A discussion on the sectors to be tackled for the projects' selection was undertaken by the partners. DELPHI found that the sectors that traditionally tackle e-Learning do rely on paradigms/metaphors as follows:

- Distance education   Information society
- Training (corporate sector)   Knowledge as a commodity
- School (secondary)   School of tomorrow
- Higher education   Virtual campus
- Special education   Integration
- Adult education   Lifelong Learning / the market society

These sectors were combined in three, since they could be concentrated in the three following sectors, which are supported by specific educational paradigms. These sectors coincide with the sectoral classification of MINERVA.

1. Adult/distance education   LLL, the learning citizen
2. School-based education   School of tomorrow
3. Higher education   Virtual Campus
   Additionally teacher training was considered a cross-sector of clear interest, since it is present in all academic levels as a key factor for the success or failure of the learning innovations.

- selection of projects

Projects were selected from within these sectors. A consultation process was followed with the Commission Services (MINERVA Programme). This process identified projects that appeared to be of interest for DELPHI and for the Commission. Also, a criteria was that the projects selected were over or close to the end.

Each partner chose a set of three projects and one project with a strong teacher training component. The projects that were selected and thereafter underwent analysis are: OpenTESS, AgroWeb, ARTE, EMILE, YouRA, Euro.Geo, AEN, I-SEA-U, ODL, EUREX, VITALAGELL, VIMIMS, BENVIC, GALECIA, NETCAMPUS, SETT, CLIENT and SUESSIS.

- specification of review parameters.

- design of instrumentation
  On the bases of the review parameters identified via the Literature Review and the consortium's experience in other meta-evaluative projects (mainly the MERLIN project) the template was designed so as to allow the six partners to record the data in a similar and organized manner.

- negotiation with projects
  As primary sources 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. It should be noted here that there were instances where the response level was high, but also instances were there was a total ignorance of the DELPHI request to establish contact with the project's contractor. Such a case is Kid-Net - ODL for Language Teaching for Children.

- drafting of case project reports

- drafting of sectoral reports

- review of commonalities / differences

- reflective analysis of sectoral reports content for the identification of indicators mainly in the areas of learning methods where ICT is involved, new skills and roles for teachers / trainers and new organizational issues.

- reflections on policy needs and drafting of recommendations.

Chapter 3: Description of Cases

In earlier sections indicated is that the phase of activity outlined in this project involved the review of a set of 18 MINERVA projects under the scope of identifying trends for/of e-learning. For purposes of clarity the DELPHI project recognizes e-learning to be interactive learning in which the learning content is available online and provided is automatic feedback to the student's learning activity. In this regard the focus in DELPHI is more so on the learning content than on the communication between learner-tutor.

The projects that underwent review under this scope, divided into the three sectors selected by the DELPHI partnership, are:

School-based education sector
- OpenTESS
- AgroWeb
- ARTE
- EMILE
- YouRA
- Euro.Geo

Adult/distance education sector
- AEN
- I-SEA-U
- ODL
- EUREX
- VITALAGELL
- VIMIMS

Higher Education sector
- BENVIC
- NETCAMPUS
- SETT
- GALECIA
- CLIENT
- SUESSIS

It should be noted here that project YouRA replaced project Kid-Net - ODL for Language Teaching for Children as the response level of the latter project to provide the content for review was rather poor.

Provided below is the description of the case projects from a sectoral perspective. These sectoral syntheses descriptions have been developed as such so as to be able to stand alone as it is believed that such a presentation facilitates the diffusion of their content to the specific target groups engaged in the three sectors. The first descriptive sub-report concerns the school sector, the second the sector of adult/distance learning and the third the sector of higher education. The descriptions presented below are further synthesized in the next chapter where the principle indicators are depicted and discussed under the scope of trends in e-learning.

School-based education sector

Introduction: main issues and questions

This report aims at providing a review and synthesis of the results of MINERVA projects focusing particularly on the innovations implemented. The review and synthesis was focused on the following questions and parameters:

1. **What are the new methodological approaches to learning in ICT-based learning scenarios?**

Parameter 1.1: Results of the project with respect to the ICT-based innovations
Parameter 1.2: Roles:
- New teacher roles identified as a result of innovative pedagogical practices
- New student roles identified as a result of innovative pedagogical practices

Parameter 1.3: Patterns of teacher-student, teacher-teacher and student-student interactions as a result of ICT and ODL-mediated innovation
Parameter 1.4: Teachers' attitudes towards ICT and ODL
Parameter 1.5: Affective and socio-cultural factors that influence learning processes

2. **What are/were the main institutional/organisational changes as a result of ICT and ODL implementation?**

Parameter 2.1: Main institutional changes described as a result of the introduction of ICT and ODL into the existing structures.
Parameter 2.2: The role of staff training in the project
Parameter 2.3: Main actors, adopters and resisters to the adoption of the innovation as identified in the projects
Parameter 2.4: Organisational conditions that are (un)supportive to the innovation

3. **What are the Socio-Economic aspects of the analysed Learning Innovations?**
4. **How innovation and its sustainability and diffusion were addressed?**
    - What was considered innovative?
    - What was the role of ICT in the innovations?
    - Were the innovations studied sustainable/scalable?

Projects reviewed
The MINERVA projects which served as case studies for this report were:

1. **EMILE**: Observation and Analysis of the Uses of Information and Communication Technology in European Primary and Secondary Schools: An Intercultural Approach (88093-CP-1-2000-1-FR-MINERVA-ODL)
2. **AGROWEB**: An innovative approach to the usage of the Internet in an interdisciplinary framework
3. **ARTE** (56438 - CP - 3 - 2000 - 1- IT - MINERVA – ODL)
4. **OPENTESS** (87656-CP-1-2000-1-DK-MINERVA-ODL)
5. **YouRA:** Young Researchers in Action (71278-CP-2-2000-1-GR-MINERVA-ODL)

Methodology

To create a synthesis on the basis of the questions and parameters presented earlier a two layered analysis was performed: first on the basis of a detailed template for each project individually and at a meta-level on the basis of a table which included main points and provisional qualitative indicators we extracted from the analysis of the projects' documentation. The documentation reviewed included the Final Reports and various deliverables produced by the project partners, documents and other materials accessible at the projects' web sites (when accessible), books produced by the projects and CD-Rom titles.

Synthesis of the case studies

1.   Scope of the reviewed projects

All projects reviewed shared a common point of departure which was set by the MINERVA wider aims and goals. A generic theme shared by all projects was the development of some kind of theoretical framework accompanied by methodologies and tools for the integration of ICT in primary and secondary education in European Union countries. However, the projects reviewed vary considerably in focus. The implementation of (ODL) models, tools, activities and training was the focus of the YouRA, Arte and AgroWeb projects, each targeting a specific area: YouRA on science teaching and learning with emphasis on meteorological phenomena, Arte on contemporary art and artists, AgroWeb on agricultural products and their trade. In the context of the OpenTess project ODL was implemented in the form of "research partnerships", collaborative electronic-based networks of teachers, researchers at local and international level. On the other side, the EMILE project, was primarily focused on the identification of differences and similarities of ICT integration in primary and secondary education in European countries. The Euro.Geo project focused at the provisions on e-learning information in geography.

Potential beneficiaries of the outcomes of the projects were primary education teachers and students (all projects), ICT coordinators (OpenTess), school administrators (at school, local, regional and national levels) and policy makers at national and European level (EMILE, OpenTess), local communities/enterprises (AgroWeb), teacher training institutions (YouRA, OpenTess, Euro.Geo) and pre-service teachers (YouRA).

2.   New methodological approaches to ICT-based learning innovations

2.1. Results of the projects with respect to ICT-based innovations

The results of the projects with respect to ICT –based learning innovations introduced and studied can be categorised in terms of products, training materials and guidelines, impact on schools, teachers and students involved[3].

Project web-sites[4] were commonly considered as an innovative component by the projects, mainly on the basis of their contribution to information and knowledge

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[3] The EMILE project did not introduce innovation and therefore its findings are not relevant in this topic.
[4] EMILE: http://www.emile.eu.org
AgroWeb: http://www2.ellinogermaniki.gr/ep/agroweb/
OpenTess: http://www.tess.dk/opentess/opentess.htm
YouRA: http://www2.ellinogermaniki.gr/ep/youra/
Euro.Geo: http://www.eurogeo.org/

diffusion (info about the projects, their activities and results, as well as materials such as workshop proceedings organised by the projects, electronic magazines etc) and communication (through forum facilities). However, the web site of the Arte project was shut down[5] in favour of a follow-up project MultimediART (www.multimediart.net), and the electronic forums that were set up during the projects are no more active.

The AgroWeb project furthermore developed the "Agro-web e-shop" platform, and the "e-tool". The "Agro-web e-shop" is a distributed learning environment for students. The e-shop platform includes facilities to monitor financial activities of a real shop. The "E-tool" is an educational tool, for the visualization of weekly sales made by participating students.

Other products were CD-Rom titles, videos and printed materials. The Arte project produced a series of short videos on art and "The ARTE CD-ROM" which contains research outcomes, the collection of the artworks created by the students involved in the project, a presentation of the project and the training course developed in the first year of the project. It has been produced in 10000 copies distributed to European schools and European Educational Public Authorities. The YouRA project produced its own CD-Rom title "Young Researchers in Action" essentially containing the project web site materials, and a printed handbook. The AgroWeb produced a CD-ROM title on the basis of the documentation also accessible in the project site.

The AgroWeb project developed training materials for teachers in three areas: ODL, e-commerce and guidelines ranging from technical guidelines on the use of videoconferencing tools and web development to instructions for business plans, and lesson plans on the basis of the e-shop platform[6]. Likewise the Euro.Geo project organized content in geography for enriching the teaching activity of the subject matter. The YouRA project developed a series of short presentations for teachers on various issues from technical (how to develop web pages) to guidelines for the construction of lesson plans and the use of ICT from scientific enquiry[7].

The impact of the projects' innovations was only possible to evaluate at a short term level, i.e. while the projects were implemented. While the impact of the projects' activities on the teachers and students directly involved in them is analysed in detail, in the following paragraphs issues resulting from evaluation activities will be highlighted.

> **Comentario:** Evidence on the actual impact is in one project only that is measured on the basis of formal evaluation research (YouRA). Other projects offer grounded insights on this issue but not systematic evidence. Regarding the AgroWeb and OpenTess projects, external evaluations of the project's processes and outcomes are available, including the impact of the project's activities on schools, teachers and students involved.

According to the OpenTess external evaluation report[8], the project increased the teachers' understanding of the educational benefits of the digital tools, educational software and in particular the Internet. The participating teachers have gained knowledge about best practice with ICT and in general their attitude towards the integration of ICT is more positive than 2-3 years ago. The schools now have a library of didactical software and digital tools and means of communication. The access to these new resources and tools can also be considered an effect of the project. ICT coordinators constantly renew the programmes. They are continuously looking for

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[5] See info from http://www.ulg.ac.be/cifen/inforef/projets/arte/arte3.htm
[6] Accessible at http://www2.ellinogermaniki.gr/ep/agroweb/htmls/uk/training.html
[7] Accessible at http://www2.ellinogermaniki.gr/ep/youra/curriculum.html
[8] See http://www.tess.dk/opentess/external_evaluation.pdf

new programmes to use, and the attitudes of teachers are very positive regarding this. Both the teachers and the pupils use the Internet regularly for didactical purposes. These changes in the educational practice can also be considered as an effect of the project. However, according to the evaluation report communication between students and teachers of different schools at international level, was the weak point of the project because of language barriers. Teleconferencing activities, in particular, had a relatively little impact on pupils' learning.

The pre/post-tests performed in the context of the evaluation phase of the innovation introduced by the YouRA project suggest that:
- there was no detectable effect concerning the enforcement of the social attitude of the students towards foreign students,
- there was no detectable effect concerning the students' positive attitude towards collaborative learning or teamwork,
- the experimental group showed a better performance in terms of their familiarization with scientific methodology as compared to the control group which did not participate in the project and served as reference group, and
- the students' performance improved in relation to the interpretation of graphical representations.

According to the AgroWeb project one of the most obvious results was a change of attitude of teachers towards ICT. Many teachers that had been reluctant to use of ICT in learning not only lost all reluctance but had come to use the computer and the Internet for school work in general. Students showed enthusiasm to participate in the project; in some cases students taught each other and their teachers how to work with the Web more efficiently. Some students, because of their implication in the project's activities, also considered very seriously the possibility of working in Web design, or e-commerce. However, the overall interest among pupils regarding foreign cultures slightly decreased during the project. In detail, the interest in information about foreign cultures slightly increased in participating technical schools and decreased in conventional schools. Concerning these quantitative results, the evaluation report argues that it is generally admitted that in ODL, the social parameter is weaker compared to the other components, and does not play a central role in students' interests. The fact that this socio-cultural interest increases in technical schools and decreases in conventional schools is probable due to the general curriculum of the latter and pupils' previous knowledge on the subject.

In the context of the Arte project, students and teachers through the focus on contemporary art deepened their understanding of creativity and expanded it to other areas of their lives. According to the Arte project Scotland representative Jim Scott, despite some problems in teleconferencing sessions, the pupils who did engage in computer conferencing responded very well. Furthermore, the pupils came to realise that contemporary art meant many different things. For example the Swedish project focused on an Eskimo artist and an ice palace. Similarly the Dutch, Italian and German ones were each very different. According to Scott, the success of the project lies in two fields – the work done at the time by pupils and teachers and the lasting resources which will have a shelf life for some time to come. The resources were further developed to a high presentational standard and made available to all City schools. Furthermore, the project enhanced the awareness and proficiency of some art teachers with ICT and the opportunities for exploiting the technology.

2.2. New teacher-student roles resulting from innovative pedagogical practices
One of the main findings of the classroom observations made in the context of the EMILE project is that there is a shift from technology-centred towards a teaching–learning centred approach to ICT in education. This finding is further stressed by the rest of the projects reviewed. This shift is accompanied by shifts in the traditional teacher-student roles in innovative ODL pedagogical practices which are encouraged by the use of ICT. According to the OpenTess project, ICT can be a catalyst for thinking about one's roles and responsibilities as a teacher. The use of computers make it easy for teachers to try out new methods and measure their effectiveness but first, according to the OpenTess project, they must make a transition in which some teaching styles and skills will be perceived as more valuable and others less valuable than before.

The role of teachers as *collaborators* of pupils and of colleagues both face to face and from a distance was commonly practiced in all projects. For example, in the AgroWeb project, students and teachers from European countries came into contact exchanging ideas and experiences and efforts were made to enhance their collaborative experiences. The OpenTess project developed collaborative networks of teachers and researchers. In the YouRA project teachers collaborated in developing shared activities. Teachers' collaboration skills and dispositions are identified as crucial in many respects. First, they support teachers in participating in formal and informal networks of teachers, which, according to the OpenTess project, can help teachers become more open towards the use of different technological approaches in solving teaching tasks and can thus lead to better teaching. Furthermore, collaboration in electronic networks makes possible the opening up of educational institutions so that a larger flow of information, knowledge and know-how is made available to a broader circle of practitioners. Good collaboration skills also enhance the capacity of schools to integrate ICT into teaching and learning. According to the EMILE project, increased collaboration and rich interpersonal relationships among the teachers minimise power-related tensions that may arise among ICT coordinators and the teaching staff, supports the decentralisation of decision-making, and has a positive impact on the effectiveness of the introduction of ICT in curriculum-based activities. Other teacher roles as related to innovative pedagogic practices were also identified. According to the YouRA project, within the ODL approach the role of the teacher shifts towards the role of co-learner, facilitator of students' inquiry, guiding student work and offering individual help; the teacher's role in coaching, observing students, offering hints and reminders, providing feedback, scaffolding and fading, and modelling are further powerful enhancements to any learning situation. The teacher as trainer of other colleagues was also identified by EMILE as a valuable role not just in innovative activities.

On the other side, the projects observed or encouraged shifts in students' roles which was characterised by considerable variation, but all stressed the importance of active learning. According to the AgroWeb project, student's self-action was the leading element in the teaching process, a point which is also stressed by all other reviewed projects which introduced ODL pedagogic innovations. The YouRA project, for example, encouraged pupils to become "young researchers" who use new technologies to process, represent and communicate 'scientific' data collected on the basis of real-life observations and teamwork. In the context of the AgroWeb project,

students assumed several different roles: recipients, instructors, team and individual workers etc. In the Arte project, students developed strategies for solving problems in team work.

2.3. Patterns of teacher-student, teacher-teacher and student-student interactions as a result of innovation

A general observation shared by all projects is that the patterns of teacher-student and student-student interactions, accompanied by a shift in the teacher/pupil roles and the use of ICT, changed from conventional classroom patterns where teachers initiate and direct classroom interaction, dominate talk and define success, to more pupil-centered, team interaction and collaboration patterns. This is not observed only in innovative practices because, according to the EMILE project, teachers encourage co-operation for both pedagogical reasons and reasons related to scarcity of resources; thus, pupil to pupil interactions are often based on small group co-operation, collaboration and shared construction of meaning. In the computer rooms, the pupils are often co-operating two and two or in a small group. They learn to listen to each other and to discuss the findings from Internet etc. Teacher-student and student-student interactions are also influenced by computer-lab arrangements and in particular how computers are arranged in the schools (traditional class, small group projects, or individual work).

Interaction from a distance with the use of ICT also greatly affects interaction patterns in learning activities; however, interaction through ICT is often problematic and heavily depends on the quality of infrastructure in schools (low connection speeds for example) and the foreign language skills of the teachers and students involved (projects reported that communication with schools abroad was often minimal because teachers and pupils did not know well a foreign language).

2.4. Teachers' attitudes towards ICT and ODL

According to the EMILE project, observations in regular classroom (not involved in innovation) revealed that the attitudes towards ICT among teachers varied enormously from fear, scepticism and indifference to wild enthusiasm and excitement. This is a point also stressed by the OpenTess project, which argues that while some teachers put a lot of effort in the successful implementation of ICT in their teaching, other teachers sometimes fear that technology will replace them. Related to the above is the remark made by EMILE project that some teachers take lack of ICT knowledge and improper ICT training by local authorities as an excuse not to use computers. Furthermore, in schools where ICT coordinators exert on their colleagues the power deriving from their know-how, there are tensions among the members of the staff and even conflicts, which put ICT in the margin of the school activities. In this perspective, crucial factors in developing positive attitudes among teachers are the provision of high quality training on ICT and the development of a collaborative climate in schools where power conflicts among teachers and ICT coordinators are minimised. For example, teachers' training on ICT and ODL during the reviewed projects strengthened their positive attitudes towards ICT and ODL, something that is exhibited by their active involvement in the projects. According to the YouRA project, the positive attitudes of pre and in-service teachers that participated in the training seminars were expressed through their active participation to the videoconferences, as well as by the large amount of contributions to the Bulletin Boards. The AgroWeb project further reported that teachers started to use ICT in

"ordinary" teaching outside the context of the project. Overall, teachers' training and preparation for their involvement, according to the AgroWeb project play an essential role because changes in attitudes, the creation of a knowledge-base among teachers and of a stimulating learning atmosphere take time.

2.5. Affective and socio-cultural factors that influence learning processes

According to the EMILE project, ICT functions as a system that shapes students' lives, learning styles, fashion concepts and social relations and produces a multiplicity of technologies of gender, social class or national identity. ICT is more than a system of communication and production tools, it is a culture with rules, genres and consumption patterns of its own. In this perspective, affective and socio-cultural factors related to learning as a result of ICT-based activities have a profound macro-social and cultural character well beyond school culture. ICT as a 'cultural' system has a cross-national character and shares many common elements from country to country. On the other side, the school culture defers from country to country because it is deeply rooted in the differences in the learning patrimonies of European countries. This "universality" of the ICT culture as contrasted to the national character of school culture creates many opportunities for collaboration and sharing which may positively affect learning processes in schools. For example, according to the OpenTess project, trans-national cooperation can raise the quality of outcomes, especially with regard to problem-solving that can take place on a level which reflects the strong cumulative effect of exchanging thoughts and ideas. Similar arguments were also reported by the Arte, AgroWeb and the YouRA projects. For example, in the Arte project, art teachers from different countries hold different perceptions on art teaching (from approaches focused on design and creation to the teaching of high art) which was proved productive for sharing ideas and methods. Students also showed enthusiasm in communicating with pupils from other countries which is indicative of the "attractiveness" of perceived socio-cultural differences to them, something that can greatly enhance learning at many different areas (affective and socio-cultural, domain specific, etc). For example, in the context of the YouRA project, pupils exhibited interest in communicating with pupils from other countries and through teleconferencing and the bulletin board pupils had the chance to get to know each other and exchange ideas and information especially on how to construct measuring devices for the study of meteorological phenomena. However, lack of foreign language skills among teachers and students are often barriers to effective communication and collaboration at international level. This is perhaps the reason why the YouRA evaluation research revealed that there was no detectable effect concerning the enforcement of the social attitude of the pupils towards foreign pupils.

3. Institutional/organisational changes as a result of ICT and ODL implementation

3.1. Main institutional changes resulted from the introduction of ICT and ODL into existing structures

The documentation of the projects reviewed offer evidence of "institutional change" only at the level of the schools involved in the sense that new interdisciplinary courses were implemented as add-ons to the existing curricula. However, the courses introduced in schools by Arte, AgroWeb and YouRA are unclear if they continued to be part of the school activities after the completion of the projects. The OpenTess project, on the other side, targeted at sustainable institutional changes through a

development strategy for the integration of ICT at school level and the adjustment of teaching methods. According to the OpenTess project, a successful reorganising process moves the use of ICT as being primarily up to the individual teacher to being a part of the responsibility of schools. ODL was used to establish "research partnerships" where professional researchers and researching practitioners co-operate purposefully on formulated development targets. In research partnerships, on regional as well as trans-national level, different actors in the educational system co-operate purposefully on formulated development targets. Teachers and school administrations have immediate access to up-to-date know-how and are engaged in the development process of their specific school. These "research partnerships" which OpenTess established were seen as agents of institutional change.

The projects' documentation offered some further insights on two institutional issues which are going to be briefly presented. The EMILE project concluded that the institutional context of schools is an important factor affecting the use and implementation of ICT. Major institutional factor is the school curriculum, which needs to be adapted to the learning new possibilities offered by ICT. The AgroWeb suggested that curricula have to be adapted in order to fit to new demands on the labour market and offer up-to-date know-how to students. At school level, the role of the ICT coordinator is sometimes not clearly defined but also schools may lack ICT coordinators. According to the EMILE project, the lack of ICT coordinators is a fundamental problem because teachers do not have a knowledgeable institutional figure to rely upon to seek ICT assistance.

3.2. The role of staff training in the projects

The role of staff training was important for all four projects that introduced innovations in schools (i.e. AgroWeb, Arte, OpenTess and YouRA). Characteristically, teacher training was assumed to be part of the innovations introduced by the YouRA project. Emphasis was given to teachers designing lesson plans so they could apply the ODL. The participating University students were also familiarized with the scientific methodology on the study of natural phenomena. The seminars themselves were organized in the form of ODL so that the teachers could develop relative abilities. In the context of the Arte project, art teachers were trained in the use of ODL methodologies, ICT and multimedia in education. The pedagogical methodology used in the project was based on the combination of real and virtual participation, and the combination of synchronous and a-synchronous communication. In the AgroWeb project, before the introduction of the project in the classrooms, an on-line course for the teachers was available, in order to serve as a reference guide for the implementation phase. The on-line lessons dealt with ODL, e-commerce and provided guidelines for teachers in the framework of the project. Finally, two recommendations were provided by the OpenTess project: a) staff training must not focus on single teachers but has to include all involved groups, and b) research findings have to be "translated", because otherwise teachers find research findings rather inaccessible and difficult to use in real-life situations.

3.3. Main actors, adopters and resisters to the adoption of the innovation as identified in the projects

The main innovation actors in all projects reviewed were the project partners and the field researchers, as well as the teachers and students involved. From a wider perspective, the EMILE project pointed out that the acquisition of computer expertise

as 'social currency' is an activity in which some student sub-groups – usually male – invest significant time and energy. In relation to ICT-related innovations introduced by the projects, active participation by the students is a clear indication that students "in principle" tend to become adopters of such innovations. For example, according to the AgroWeb project, the students involved showed enthusiasm and eagerness; in some cases even taught each other and their teachers how to work with the Web and often worked on the project on their spare time. Similar student behaviours are reported in all projects reviewed.

On the other side, teachers range from potential adopters to potential resisters to innovations. According to the EMILE project, teachers seem to take full advantage of the degree of freedom they are given by choosing to use ICT or not - based on personal choice, their taste for technology, their aptitude for computer literacy, and/or their convictions relative to the teaching effectiveness of such technology. The result is that the significant pressures exerted on all the players in schools, appear to have a relatively limited effect on the teachers themselves. Lack of ICT skills is a major factor that contributes to resistance in ICT-related innovations. Furthermore, some teachers are sceptical about the potentials of ICT for teaching. According to the OpenTess project, some teachers have serious concerns about use of ICT and they want to avoid "experimenting with children". As the AgroWeb project observes, changing what they think as appropriate pedagogy for the learners, themselves and their subject area may be difficult. This can be even harder when teachers act in isolation from one another and are not exposed to innovative models of learning. Additionally, OpenTess pointed out that conservatism and job security in some educational systems can foster resistance to technology. On the other side, teachers who are ICT literate and have positive experiences in introducing ICT into their teaching can be active adopters of ICT-related innovations in teaching. As the AgroWeb argues, teachers that have by themselves experienced the qualitative upgrade ODL can bring to their teaching practice are effective "promoters" of the idea in the teachers' community.

Other pressure groups identified as playing a potentially important role in the adoption or rejection of an innovation in schools are parents, school administrators, pedagogues, enterprises and political authorities. According to the EMILE project, parents tend to exert minimal pressure to schools. How their demands are taken into consideration depends on local conditions and how good a relationship parents have with teachers in the school. Pressure from administration and political authorities over schools to integrate ICT into school teaching appears to be universal, systematic, and strong but there is not clear indication if this pressure includes ICT-related innovations. Non-economic lobbies do not always share positions. Some are against the computerisation of schools and the tendency for commercialising education that they believe goes along with it. On the other side, groups such as educational research scientists who work in the area of the educational use of ICT exert pressure on teachers to change their methods. Enterprises can be active promoters of ICT adoption in schools and innovations related to their interests. For example, in the context of the AgroWeb project, the enterprises involved were main supporters of the innovations as they profited through the promotion of their products and also profited by the perspective of getting students/trainees as already qualified personnel.

3.4. Organisational conditions that are (un)supportive to innovation

A major organisational issue at school level are the arrangements regarding the placement of ICTs in schools. According to the EMILE project in many countries, the administrative authorities tend to favour the computer lab solution. This has some advantages over the solution of spreading computers in classrooms (networking, whole classroom use). However, as the EMILE project argues, the PCs in the classroom solution allow for more profitable educational activities than those held in the computer lab, where there are schedule-planning constraints.

The OpenTess suggests that a ICT development plan clearly enhances the capacity of schools to integrate ICT and absorb ICT-related innovations. A detailed technology plan considering funding, installation and integration of equipment, ongoing management of the technology etc. should express a clear vision of the goals of the technology integration.

Furthermore, as the AgroWeb project argues, an organisational culture that is characterised by teacher collegiality and formal or informal collaborative work, both supports and facilitates the development of the organisation's members.

Other organisational conditions identified by the YouRA project as supportive to innovation are flexible time-tables, flexible allocation of staff tasks and roles, supportive administration and incentives. As it is pointed out, flexible timetables allow involved teachers to organize teamwork and ODL activities; flexible allocation of on-duty time for teachers help teachers design activities and lesson plans, organize collaboration with other schools etc., and the existence of administrative support structures and incentives encourage teachers to engage in innovation.

4. Socio-Economic aspects of the innovations

None of the projects reviewed focused on socio-economic aspects of the innovations introduced. Issues such as socio-economic background of the schools involved were not raised by the projects reviewed. Other parameters such as the impact of gender or age, citizenship, inclusion were also not mentioned. This is also true regarding the potential socio-economic impact of the innovations. Only AgroWeb made some contributions on this point as it involved enterprises. As the AgroWeb project argues, it influenced students' attitudes towards e commerce; they used the Internet more often in order to buy different kind of items at the end of the project. Furthermore, the students considered the Internet not only as a communication tool or a source of useful information but also as a daily service. Finally, students acquired tele-working experiences, organizational and management skills that are key competencies for tomorrow's European workers

5. Innovation defined; its sustainability and diffusion

5.1. What was considered innovative?

The four projects that introduced innovation in schools defined differently innovation but shared common characteristics. AgroWeb, Arte and YouRA essentially defined innovation as the implementation of ICT and ODL in a specific of teaching/learning field (e-commerce, art and science respectively), collaboration among teachers and students at international level and training embedding ODL activities. On the other side, OpenTess build upon the idea (and its implementation) that the essence of a

successful reorganising process is to remove the responsibility for implementing ICT in schools from teachers to higher administrative units.

5.2. What was the role of ICT in the innovations?

In the context of the AgroWeb project, a web enabled application platform was developed that incorporated two major components: the e-shop and the e-tool.

- E-shop: is a distributed learning environment which included facilities to produce graphical representations of the sales of a product, to compare actual and anticipated performances and in general what is necessary to monitor the financial activities of a real shop. Using the e-shop the students promoted agricultural products of their areas in order to sell them on the Internet. Students also had the possibility to endeavour the sale of products through an electronic shop that has the form of an interactive web page. In this way the reality of modern economy practices has been transferred into the classroom.
- E-tool: is an educational tool, enabling to visualize weekly sales and from which countries purchases were made, to compare the estimated and the actual sales, etc. Students could then discuss whether their estimations were right and if not what they could do to promote their product in the "market", to enhance their sales etc.
- E-mail and telephone, videoconferences and bulletin boards were used as communication facilities generating and supporting dialogue within the ODL project.

In the context of the Arte project, communication via the project website and the development of multimedia elements on the CD-ROM were integral part of the pedagogic methodology.

The OpenTESS project did not concentrate on specific hard- and software or tried to develop new tools but aimed at the continuing improvement of ICT implementation in teaching and training.

Regarding the YouRA project, the role of ICT was central to the innovation introduced; its role was to be an add-on to existing school practices. According to the YouRA project, the involved partners tried to create a style of its own blending the 'best' of old and new practices: maintaining good teaching, maintaining the positive experience students have while working collaboratively on projects to solve real-world problems, but adding new technologies and new pedagogies to accompany these old values.

5.3. Were the innovations studied sustainable/scalable?

The "AgroWeb e-shop" is considered as sustainable outcome of the project which may be maintained as an e-commerce training tool by interested parties after the completion of the project. However, AgroWeb partners show that scalability is limited as more project partners (resp. more products) would lead to confusion.

The positive experience gained from the ARTE-project was the starting point of a follow-up project called MultimediART.

According to the OpenTess documentation, the project had an immediate impact in staff and administration of participating schools and in the policy development of participating countries. Results were also extended in other educational areas. OpenTESS states that for instance, in Denmark the eLEARNING strategies were

applied in the extensive national quality programme on special needs education, the KVIS programme (http://www.kvis.org). The experiences from the OpenTESS project were also used in the Leonardo programme's SPERO project (http://manolito.image.ece.ntua.gr). Members of the OpenTESS network participate as partners in this innovative project about ICT and special needs education. Furthermore UNESCO is applying the strategy and experiences in an upcoming major third-world education project (http://specialedu-seminar.iite.ru/). According to OpenTESS several members of the OpenTESS network participate in UNESCO's eLEARNING project.

The YouRA project partners made en effort to integrate the use of ICT and ODL in existing school curricula with a view to maximize the sustainability and scalability of the project activities. In this context, according to the YouRA project, an interdisciplinary subject, such as meteorology which was selected by the project, is easier to integrate in the curriculum than a "conventional" non-interdisciplinary one because the teacher will have much more time for the project's implementation during the school weekly program.

Open and distance learning sector

General Introduction
Six projects were reviewed, all of which were initially, fully or partially funded under the SOCRATES MINERVA action. The reviews and subsequent sectoral synthesis are intended to focus on the following questions and parameters:

a)   What are the new methodological approaches to learning in ICT based learning scenarios
b)   What are/were the main institutional/ organizational changes as a result of ICT and ODL implementation
c)   What are the socio-economic and socio-cultural aspects of e-learning innovations.

Only two of the projects (AEN and EUREX) have been completed under the original contractual terms of the Minerva Action, the rest continue in progress or have been extended. One has been in progress since 1999. Access to documentation about the projects has consequently been varied, in some cases interim or final reports are not available and a detailed examination of "products" or outcomes, has not been done because as yet these are unavailable. It is therefore not possible at this stage to indicate, rather than speculate for example, what effects can be determined on organizational or institutional structures in specific entities as a result of ICT and ODL implementation.

EUREX which was a one year project initially under this action now has continuous funding under other funding sources until at least 2006 and appears embedded in the 14 European university institutions that currently offer the seminar. AEN is completed but there are indications that it suffered from under-funding and perhaps not meeting the expectations of the Commission which is manifested in very delayed payments, although this is not totally clear. ODL Inclusive which started in September 2000 is still in progress and has been extended until March 01/2004. At the moment the

project does not have final results. I-SEA-U which is co-funded started in 1999 but has been extended until the end of the summer 2003: the open and distance learning part of this project was funded under the MINERVA action. VIMIMS and VITALAGELL which were more recently incepted are in progress.

All of the projects were concerned with the production of on-line ODL courses for various target groups and users and in most cases involve training and familiarisation of all users (teachers and students/users) in the media used and an understanding of the "interactivity" or "cross-walking" that the new technology engenders. In addition, the development of course content and transmissive methods between users appropriate to multimedia platforms is perceived as a function of training/learning to be embedded into the whole process. All the projects indicate a full understanding of the need for adaptation of traditional curricula and teaching and learning methodologies to new media. As all the projects were initially funded under the MINERVA Action it was a precondition that the projects would be engaged in cross country collaborative activities which involved exchange of knowledge, results and practice and the sharing of resources and data. Most of the projects explicitly referred to issues of pedagogic practice including course design, increasing interaction and motivation: organisational issues such as arrangements for interdisciplinary/ international collaboration, information and communication concept, and costs and marketing: issues such as functionality and multi-media integration were also referred to. Some concerns were expressed on issues relating to lack of clarity and practice in areas of copyright law and privacy.

All of the projects to a greater or lesser degree incorporated characteristics of what has been termed learning technology clusters (Cullen & Frade 2000). These include simulation systems (typically focusing on individual learners and a "cognitive constructivist" approach) – also now using virtual reality platforms. Interactive classrooms – typically retaining the conventional didactic "teacher-student" metaphor: the virtual campus – the conventional university or aspects of it revamped to accommodate to technology use: knowledge networks – mainly involving and putting together constituencies of experts – an example is the co-laboratory: and learning communities with an emphasis on social inclusion and co-production of knowledge. It is not apparent that in themselves the array of IC technologies used in the projects reviewed generated or imply new forms of learning or that they have enhanced access to education or learning opportunities previously not reached. There is however with VITALAGELL an attempt to reach out to a demographic group not recently associated with technological literacy – the retired and elderly. It is the case that what we do see in the main is the application of stable technologies into new contexts and new domains in an attempt to develop new forms of association within educational communities. It might be fair to comment that this represents a process of making conventional forms of learning more accessible for more people already within or nearly within technologically literate communities. Innovation as a notion in this context is therefore contested. What we do see are "innovation images" reflecting the complex interaction between economic, institutional, technological and educational forms and processes. There is little evidence that learners and users are allowed a major input into the design of the systems: systems which are often defined by assumed characteristics and needs of the target groups. There is also little evidence of new methodological approaches to learning in ICT based learning scenarios being developed. To a large extent this state of affairs in projects like these may be

determined by the structure and approach of the funding agencies from which they seek support for the trialling of their activities as well as reflecting rigidities in institutional structures, methodology and practice.

All of the projects as we have noted, in line with European programme criteria, are pan European usually connecting various types of educational entities and in some cases connecting directly to industry. What is clear is that the particular structures have great variation in the degree to which they can implement new learning technologies. The disparate and outreach nature of adult education with its important component of informal and non formal learning, open access and its more varied users combined with historically inadequate funding in infrastructure has greater difficulties in accommodating new learning technologies for its purposes than is indicated for example in the implementation of the higher education based EUREX on line seminar.

These six projects involve 14 countries with a range of institutions involved: the dominance of higher education institutions is noticeable.

Country	HE	Adult Education & Distance Ed. Centres	Schools	Industry/ company	Nat/Int Organization	Outreach
Italy	6		1	1		2
France	3					
Germany	6		1			
Hungary	2					
Spain	3					2
Netherlands	2		2			
Belgium	2					
UK	5				1	
Austria	4		6	1	1	
Czech R	1					
Norway	1	1				
Denmark	1					
Sweden				1	1	
Portugal		1				

1.   Scope of projects reviewed
1.1. Introduction
ODL Inclusive aims at developing an internet-based ODL-course for teacher training in the field of inclusive education and at providing an information and communication resource-network for teachers and experts in this field. The central course material is intended to be online or as CD-ROM for individual studies. Course providers can get licenses for the course and enrich it with their own materials and student assignments. The online course is described as "*surrounded by an information network that represents the regional infrastructure in the field of Inclusive Education*". The project follows the objectives of the Salamanca declaration of the UNESCO (June 1994), which stress the importance of Inclusive Education of children with special needs for their individual development and for the development of solidarity in society. One key issue for the development of inclusive schools is teacher training and to the knowledge of the project currently there exists no ODL-framework for this goal that is sufficiently complete with respect to the content, the targeted academic level and an

adequate didactical setting. The Inter North Sea University (I-Sea-U) pilot project is described as establishing and operating an actual and a virtual network of (university) colleges in the North Sea Region to enhance knowledge and awareness about the North Sea regional and social cohesion, resources conservation and development, thus supporting a spatial development oriented trajectory to the Virtual Universities for Europe. A range of modular courses are being offered at postgraduate level within the on-line network which are: MSc in Integrated Coastal Zone Management, MSc in Sustainable Tourism & Hospitality Management and MSc in Building Surveying and Real Estate Economics. The VITALAGELL project is concerned with how to address the issue of increasing collaborative participation in use of IC technologies as a learning medium for the over-sixties on a pan-European basis. The dual goal is to get people normally not IC users into new media usage through telecommunication and satellite technologies in the context of a lifelong learning dimension, and at the same time, develop course materials based on an appropriate pedagogic model to train people over 60 how to live healthily, improving and developing their lifestyle and levelling up their general quality of life. VIMIMS is concerned with establishing an internet-based virtual institute focused on knowledge sharing and integration of competencies in the educational and research area of analysis, design and performance evaluation of industrial manufacturing systems. The project aims to promote an active and participatory role of students by involving them directly in concrete project works based on real industrial case studies (provided by two industrial external partners of the consortium). VIMIMS is to be implemented in an Internet portal which offers students and researchers from around the globe opportunities to study, teach, research and communicate.

Of the two completed projects, EUREX was originally a one year pilot for the development of an on-line Seminar on processes of social transformation and social exclusion impacting on European cities and metropolitan areas and to base its interaction process on ODL IC technologies allowing a cross-country dissemination of recent theoretical and empirical findings in the field. *socialising* participants without ODL teaching experience to use IT devices within their teaching activity. It currently operates across 14 European Universities and offers a 72 hour accredited postgraduate module on an annual basis. It can be described as having achieved both sustainability and scalability. AEN is described as the cooperation of European partner institutions to make progress in the practical implementation of "electronic learning" in adult education at a distance: a kick off for the partner institutions to make a leap forward with regard to changing traditional ways of distance learning towards new and innovative ways of teaching and learning in LMS. Specific outcomes were the development of courses in introductions to the Internet for teacher training students customized to their particular institutional and cultural settings.

1.2. Definitions of e-learning within the projects

The European e-Learning Action Plan (2001) defines e-learning as the use of new multimedia technologies and the internet to improve the quality of learning by facilitating access to resources and services as well as remote exchanges and collaboration. The American Society for Training and Development defines that e-learning is the use of the internet and digital technologies to create experiences that educate. E-Technologies do not change how human beings learn but remove constraints: e-learning is not just web-casting lectures and not training materials dumped on-line (Horton 2001 quoted by Varis)

All of the reviewed projects to a more or less degree can fall within the paradigms suggested above. However, on the basis of the so far existing available documentation, the notion of e-learning is not specifically attributed within the EUREX, VIMIMS and VITALAGELL or the other projects. Rather it is implied as a "landscape" in which IC technologies are perceived as an "array" which add to, facilitate, go "hand in hand" with "traditional" methods of learning, discourse, instruction and teaching and which widen access for users. The clearest exposition of this comes from the VIMIMS project, for example, which reports that its virtual institute concept calls for a coherent analogy with a "real" institute and this is the main design principle in the creation of the architecture of the web portal site. The VIMIMS environment is not being created to completely replace "face-to-face" learning, but to support it with specific distance learning components, with adjunctive contents and the support of collaborative on-line services.

2.   New methodological approaches to ICT-based learning innovations
2.1. General pedagogical issues
The main focus of ODL Inclusive is to develop a teacher training course for beginners in the field of inclusion and aiming at the development of a professional attitude of the students in their respective areas of work. ODL Inclusive was concerned with developing on line course content that took account of different forms of teacher training throughout Europe.

The reviewer did not specify the main learning issues for I-Sea- U but it was indicated that the content of the three Master study programmes will be used to facilitate a *"learning through doing"* approach. Through partnerships with local university colleges, I-SEA-U will try to facilitate greater access to higher education for students with special educational needs and will deliver education programs, which are particularly suited to students in the more remote and rural communities of the region. Target groups will be 'regular' and 'continuing' students, as well as industrial target groups, SMEs and special social groups. Students will be encouraged to complement their home university study programs with credit-bearing courses from other institutions. Additionally, they may be able to complete their final year studies at optional campuses if they so desire. All I-Sea-U study programs will be accredited in line with national credit accumulation and transfer standards.

VIMIMS is concerned with evaluating the effectiveness of its platform particularly as a means of examining whether teachers and students will be able to a greater or lesser degree share questions, information and knowledge exchange. The platform will consists of five sections modelled on the structure of a real university and providing educational material and tools for theoretical lectures, practical laboratory activities and virtual visits to industrial manufacturing companies. There will be auxiliary services of the Internet site, such as the chat, forum, messenger and other communication services, to facilitate communication amongst students and researchers. VIMIMS courses will be designed according to a modularization principle in order to allow customisation and delivery of on-line courses in the different educational institutions of each national project partner. For EUREX, the interaction via chat (synchronous) or via forum (asynchronous) is perceived as creating a new learning community, exploiting the new IT and allowing debate on precise issues addressed in the written lectures and in the reading material. These relatively new medium are seen to partly modify the interaction rhythm and the way

contents are presented. Both students and scholars go immediately to the information/communication point and what are termed shy students are expected to participate more actively to the interaction process. The notion of co-production seems underpinning in that scholars-tutors- students proactively function together in the "learning process".

AEN reported that there was a strong focus in the partnership on the practical work with adult learners, which meant that each of the partners working with adults dealt with pedagogical issues in the implementation of e-learning methods, in particular with the methodological challenge in the change from paper-based to web-based material.

2.2. Teaching and learning philosophies

The reviewer noted that for ODL the main goal is to have *"high structure and high dialogue" We believe, that highly structured course material is necessary to ensure a scientific level of interaction and to make the inherent cohesion of the subject visible. We don't think that only open tasks and assignments with a high level of dialogue and cooperation are sufficient to reach this goal. (Besides the workload of teachers would be exorbitant when trying to reach the same results only in discourse.) And we think that a high level of discourse is not a contradiction to highly structured materials. On the contrary, the combination of these issues ensures the utmost autonomy of the learner while guaranteeing a discourse on an appropriate level of scientific understanding.* Students are able to reach a high level of understanding of the subject by studying individually and contribute their findings to an open discourse with peers, tutors, and teachers. ISU reported that the programs are developed to support flexibility. AEN perceived that pedagogical and methodological issues are at least as important as technological ones. There was a strong focus in the partnership on the practical work with adult learners, which meant that each of the partners working with adults dealt with pedagogical issues in the implementation of e-learning methods, in particular with the methodological challenge in the change from paper-based to web-based material. However the project commented that, *we felt quite left alone, as a so-called methodology of e-learning is hardly in sight until the present day.*

The VIMIMS platform has been planned in order to be modular and adaptive to the characteristics and needs of the users: the teaching methodology of the teachers: the peculiarity of the content and topics concerning the different subjects. In addition to the educational materials a great number of synchronous and asynchronous services have been provided as routes for users to get in contact and interact. The project will be able to examine whether teachers and students will be able to a greater degree to share questions, information and knowledge exchange. In VITALAGELL, the underpinning of the pedagogic model proposed is rooted in extensive research in gerontology and pedagogy in an ODL context and on practice in the field. Modern technology can bring about *"presence at a distance"* (through video-conferencing, chat rooms...et al) and NETTUNO has developed an ODL didactic model with a method of teaching/learning that is synchronous (teaching and learning happening at the same time, but not in the same place) and diachronic (training and educational processes that are no longer tied to the same time and place). EUREX considers all participants to be co-producers of knowledge or "multipliers". Each on-line seminar adds to the knowledge and experience previously gained. There is a trickle down effect which first produces and adds to material in the field and secondly "socialises"

those participants without ODL teaching experience to use ICT devices within their teaching and learning activity. The use of innovative technologies allows the overcoming of the time-space gap giving more effective access to up-to-date information from ongoing research at a European level. Whilst essentially the "seminar" is a traditional scholar-tutor-student relationship with embedding in what can loosely be termed as an intelligent tutoring system platform, a distinctive feature is the underpinning notion of all participants being "multipliers" – adding to the general stock of knowledge.

2.3. Teaching techniques, methods and devices

AEN, in order to address the pedagogical and methodological questions and the transfer from paper-based to web-based material, initially decided to develop their own LMS which proved very difficult and in consequence decided to focus on testing commercial systems and to develop evaluation criteria for their use in daily practice within adult education. These included Blackboard, First Class, Lotus Learning Space, eLS and Formare. BSCW was used as an electronic workspace and communication tool. Electronic networks were established and electronic learning platforms were established in partner institutions working with adult learners. ODL Inclusive developed online course material to be used by the individual student and rich media (mostly video) was used to present insights into classroom or other field work. The system included Base LMS. eLearning Suite (Hyperwave Systems) but had to be substantially modified to suit project needs. The most important modifications were: introduction of a course graph with required and optional paths for the student instead of a linear course structure: provision of an appropriate navigation system for this complex course structure: introduction of SMIL-based media (e.g. video plus subtitles): implementation of an assessment workflow that required the student to perform certain tasks before accessing the next content. This then allowed exchange with peers, tutors and teachers in structured forums: live communication in working groups (chat-based): group work in projects based on workspaces: experts-exchange on specific problems (problem solving approach): providing different assessment methods that gave enough flexibility for complete online assessment, but integrated conventional assessment (offline): provision overviews of assessment results for the students, tutors and teacher: implementing direct links between course content and forum discussions.: implementation of a small workspace feature for project oriented group work in close relation to the course content. For the exchange platform the project adapted a version of the community platform phpbb, added expert lists, a voting scheme and content-management features. Video is perceived as the main medium for presentation of practical examples into the classroom

ISU uses web based content and services. Face to face seminars incorporated visual material (video) and new information was able to be presented online every week.

The VIMIMS platform has been planned in order to be modular and adaptive to the characteristics and needs of the users: the teaching methodology of the teachers: the peculiarity of the content and topics concerning the different subjects. In addition to the educational materials a great number of synchronous and asynchronous services have been provided as routes for users to get in contact and interact. The project will be able to examine whether teachers and students will be able to a greater degree to share questions, information and knowledge exchange. The VIMIMS consortium will test this integrated learning scheme in the context of different educational institutions,

ranging from Universities (i.e. IFA, INPG and Politecnico di Milano) and research centres (i.e. SZTAKI) to secondary schools (i.e. ENFAPI Briantea). The devices specified included: Virtual lecture theatres: Virtual Tours of industrial sites: Virtual laboratories: Virtual library; Content providers: Network services: Content services (modules & tools): Communication Services (Blackboard, Agenda): Interaction Services (Forum, Chat –in real time, User Homepages): Evaluation Services (Self-assess, examinations): Administration Services (Administer course, edit course with on line web editor, edit quiz). It should be noted that VIMIMS derives from extensive testing in single institutions over a significantly long period of time. In VITALAGELL – the open and distance learning component is comprised of -teacher's video-lessons (broadcast over television) -practice exercises (through Internet, multimedia material, video and computer conferencing) distance tutoring (through telephone, video, audio, and computer conferencing, fax, e-mail, computer forums and chat rooms). The Web site is aimed at allowing the target group to be fully involved in the project and at the same time to be tested regarding their attitudes towards new technologies and ODL courses. In particular the didactic function of the web site will allow linkage of lessons broadcast on TV with the activities part of the distance learning method. Through the web site the users will interact with their tutors, carry out exercises on the web, study and extend knowledge on some specific themes surfing on the web, using computer forums and chat rooms. The users will be involved in the set up of a direct channel with the video-teachers, the tutors and other users to create a meeting crossing point in a dynamic environment where everybody can share and discuss his/her opinions.

EUREX uses two main technological environments: a web site on which all the didactic material is published: a computer conferencing system - realised via the FirstClass$^©$ software - that permits the creation of virtual classes in which professors, tutors and students can interact: QTVR technology for visual mapping. QTVR allows the creation of interactive virtual reality scenes with point and click simplicity: photos and computer renderings can be turned into 360 degrees views called panoramic views as well as object movies that allow users to view an object from all sides: both objects and panoramic views can be fully interactive, with zooming, animation and hot spots linked to other multimedia objects. The FirstClass$^©$ software permits: send and receive e-mail messages in a protected environment (just emails related to the seminar will be processed in this environment: send e-mails to public forums on specific topics: Chat in a protected environment. Each professor prepares a written lecture on a specific topic that is published on the EUREX web site and is discussed with the students in a synchronous chat. The professors participate in an online forum (minimum period: the week after the chat), to answer the questions that the students may pose him/her by e-mail and, eventually, to tutor one or more students for his/their final paper/s. The role of the European tutors is to co-ordinate the work of the local tutors and to moderate the twelve synchronous chats. The local tutors (one in each participating university) have the following functions: They inform the students about the reading material and the activities to be done each week: they answer the e-mails sent by the students about various problems related to the seminar: They co-ordinate the relationships between the online students and the forum students: They help the students, in collaboration with the professor, in the preparation of the final paper. The web master's role is to organise the structure, the graphical appearance and general organisation of the web site and to this collaboratively. After this first organisation, together with a constant monitoring and upgrading of the web-site, her/his functions

are the following: To publish on the web site the twelve lectures provided by the professors each week for online reading: To publish on the web the text of the chats: To create and manage an online forum: To create the online evaluation environment: To answer to the questions and comments posed by tutors, professors and students related to the general organisation of the web-site. The IT Manager has to provide a stable and user-friendly technological environment for the correct development of the seminar in collaboration with all participants. For each University involved in the EUREX project 3 or 4 students are able to participate actively to the seminar. The total number of the online students is always only between thirty and forty.

2.4. Teacher and student roles

All of the projects indicate a recognition of the change from a teacher-centred to a learner centred approach – a trend not wholly deriving from new technology use. However, it is clearly not the case that this trend makes redundant the traditional role of teacher. What is interesting as far as can be ascertained is the retention of what is called the traditional role of the teacher together with not merely a recognition of "students" as co-producers of knowledge but a real intent to explore whether the technology will enhance that extra dimension in the teaching/learning process and if so how to embed it. This could imply a new methodological approach in the pedagogic paradigm in the context of new learning technologies but only where it also encompasses a self-conscious recognition of the need for new competencies for all users and a thoroughgoing process to recognise and develop those competencies. This is a complex process and goes beyond, but includes, training and socialisation of users in technology devices and introductory courses to the Internet. Overall in all the projects the roles of teachers and students, regardless of the context, remains unchanged. This does not mean that this will not change but the evidence for this is not yet apparent in the reviewed projects. The outcome of VITALAGELL, however may give rise to some differences as the target groups of users are among people long outside the protocols of the educational arena. This may also be true of the ODL Inclusive approach. The EUREX project is based on the interdisciplinary co-operation of well established professors in the field of urban studies in general and of social exclusion, housing, segregation, migration, poverty, social policies in particular. Whilst it presents as a traditional postgraduate academic seminar conducted virtually, it is significant that that each participant including technical support is perceived as a co-producer of knowledge. In that respect the IT manager and web master are embedded into the process. As in some of the other projects the notion of "roles" of teachers and students in some emergent way is being challenged.

2.5. Teacher and student interaction

All of the projects are concerned with enhancing teacher, student, user interaction and all of the projects contain a similar range of services which they specify as aimed at improving interaction. These include content and communication services, interaction services (Forum, Chat –in real time, User Homepages) and Evaluation Services (Self-assess, examinations) together with Administration Services (Administer course, edit course with on line web editor, edit quiz etc).

Interaction depends not merely on the technology devices used but on the users clearly "seeing" how to do it. Some projects appear more transparent than others in this respect. Users of VITALAGELL through the web site can interact with their tutors, carry out exercises on the web, study and extend knowledge on some specific

themes surfing on the web, using computer forums and chat rooms. Users will be involved in the set up of a direct channel with the video-teachers, the tutors and other users to create a meeting crossing point in a dynamic environment where everybody can share and discuss his/her opinions. EUREX typifies a high level teacher-tutor-student interaction which is characterised and contained by the limited number of participants in each seminar. This does not preclude "public access" in that students from the other courses of the professors involved in the project can visit and interact in the on-line forum. Interaction in respect of EUREX can best be understood by viewing the format of the seminar: The current form of the seminar corresponds to a course of 72 hours (run Jan to June each year). Participants have to read papers in English, attend the online seminar according to the syllabus and the visual seminar, and write a final paper. Specifically this involves: attending 12 online lectures after having worked through the reading material prepared ad hoc: make use of a web based forum for further academic discussion on the issues at stake: participate in the visual seminar during which they will be asked to take pictures of their own city or urban environment according to common guidelines: write a final paper, either at their home institution or at one of the university/research centres the scholars belong to or within the UrbEUROPE RTNetwork which is now co funding EUREX : All activities are carried through the internet and participants receive userID and passwords to access restricted area domains. A typical "week" of the current online seminar is organised in the following way: The first day of the week a written lecture, integrated with bibliographical material, will be published online.: The students have the possibility to read it for thirteen days: On the fourteenth day the professor, the students and the tutors meet each other in a virtual class in the Firstclass environment for a chat.: On the fifteenth day the web-master will publish the text of the chat: In the following days, all the chat actors have the possibility of continue interacting in a public forum published on the web site. What is characteristic of EUREX is the transparency of its structure to all participants and the integrated technological platforms that facilitates interactive virtual working.

2.6. Attitudes of teachers & students towards ICT
VIMIMS, EUREX and VITALAGELL all indicate highly positive attitudes from teachers and students. In the case of EUREX all participants are fully committed to the use of new technologies as the purpose of the project was the creation of an online seminar using multimedia platform which was rooted in considerable technical demonstration and practice derived from four successful experiences in line distance learning. All three of these projects derive from long standing experimentation in the field and it may be that a cadre of committed practitioners and users has moved forward together accumulating knowledge and experience and able to operate in established (if not perfect) structures for virtualized ODL. On the other hand, as been noted, within adult education and in the arenas outside of higher education, open and distance learning in electronic learning environments, as ODL Inclusive has emphasized, is a very big challenge for staff members. They comment that on the one hand, it quite often leads to higher motivation among younger teachers, but on the other hand it favours competition among teachers and fosters anxieties like being regarded as a loser in case of computer illiteracy and increases the readiness to retire or leave the institution. Teacher attitudes can therefore be hostile and unsettled. Within adult education students perceive the PC as a useful learning tool but AEN found that many adults who used PCs in their workplace were less than enthusiastic about using the PC as a learning tool. ISU reported the comments of one teacher who

taught the same course for traditional on campus students and for distance online students. He noted that he used the same online course material for distance students and for on campus students and that his personal view was that the face-to-face students were less enthusiastic about the online material and also that they obtained better grades than the distance students. In AEN six colleges for second chance adults in one province were selected as model schools focusing on practical implementations of e-learning. The outcomes appeared successful on the part of the students and it was clear that teachers were happier when focusing on teaching and pedagogy rather than the technology and administration.

2.7. Assessment

All of the projects incorporate various forms of online assessment including self-assessment. Within ODL Inclusive, types of assessment-workflows were integrated into the LMS and included formative assessment (Self-tests with direct feedback: Directly linked contribution to a forum requesting peer feedback: Submission of tasks to tutors with asap response) and Summative assessment: Submission of papers to teachers with grading workflow: Submission of group results to teachers based on workspaces: Integration of offline assessment results into the assessment workflow) ODL Inclusive described the assessment system as *forcing* the student to engage seriously in the learning process: Peer feedback leads to mutual help and sharing of knowledge. The assessment system integrates well into the conventional workflow of teacher training institutions. The project reported that their evaluation process will be mainly concerned with contents, tasks and assignments and adequate assessment procedures with the clear objective to enhance the course by itself. It can be assumed that the outcome of the evaluation process will more clearly present the pedagogical issues specific to this very specialized area.

Within ISU, traditional exams have been used together with ECTS grading. In respect of AEN the reviewer reported that the project stated *…"it (assessment) turned out to be hard. We only had experiences with comments & feedback in word documents"*. Later in the project focus was on assessment tools that were integrated in commercial LMS systems. Initial activities undertaken were with regard to electronic corrections and marking. EUREX requires completion of 72 hours of course work, successful completion of which will earn 9-18 ECTS credits and various self assessment and checking systems are available online.

2.8. Teacher workload

It was reported, particularly by AEN, ISU and ODL Inclusive, that although face-to face meetings as well as communication, feedback and guidance via Internet-services are regarded as essential elements of computerised distance learning, it is very time-consuming and demands adequate evaluation. Currently teachers feel that they have to do lots of extra work without getting extra money. ODL teachers needed professional support with regard to content creation and the use of authoring tools and do not want to be exploited as cheap content developers for companies. The project did not provide any recommendations on how to decrease online teacher workload. There was a clear and obvious increase due to the fact that teaching at a distance in LMS requires large input and coaching on the teachers' part. Within ODL Inclusive - self-tests for students are used to reduce teacher workload; also many tasks address groups of students and ask them for peer evaluation. Readymade expert-statements in forums are introduced automatically when the students have written their contribution. Most

important for the reduction of workload is the use of tutors (alumni): Teachers can handle a larger number of students than in conventional courses. In ISU - the teachers reported a heavy workload, even though they could be characterized as technology enthusiasts. They received additional pay for the teaching or the project paid the department to reduce their ordinary workload. AEN reported that new flexible competence centres for distance trainers were to be founded to provide also technical support in the field of multimedia. No reporting available on this from EUREX, VIMIMS and VITALAGELL

2.9. Teacher collaboration
All of the projects are aimed at increasing teacher collaboration. Within ODL Inclusive, the "teachers-exchange" platform offers teachers the online-facility for cooperation – and to problem solving with respect to the e-learning course. Teachers provide others with their experiences and offer new modules and ideas for enhancing the courses. ISU reported that online teaching was a lonely activity and that there was little collaboration among online teachers. The communication was between the tutor and the students. Within AEN, example material was developed within the project and a European network of teachers ("AEN te@chNET") was established in the electronic project workspace to foster co-operative activities of teachers in the participating institutions EUREX comprises international scholars who are well known in their field and to each other and who are used to common and regular exchange of ideas, experience and knowledge: Collaboration is high. VIMIMS and VITALAGELL indicate high levels of collaboration.

3. **Institutional/organisational changes as a result of ICT and e-learning implementation**
3.1. Main institutional changes resulting from introduction of ICT and ODL into existing structures
ISU reported that the project faced various administrative and financial challenges. Among other things it has learned to: Start with clear agreements, including realistic budgets, work plans and legally binding contracts between partner schools: Ample time is needed to apply for permission from government entities to create new programs and market the programs successfully. I-Sea-U was restricted in its timeframe. Legal issues also need time to be resolved: Individuals need the backing of their institutions. Likewise, administrative bodies need to have gained the interest of teaching faculty: Be prepared for personnel changes. There are however several barriers related to copy right issues which raise questions for organisations.

The following comments were contained in the review of the completed project AEN on organisational change: *All partners who work with adult learners realized computer based open and distance learning courses in electronic learning environments by the end of the project period which can be regarded as a big step forward, in particular because most of them used the project as a vehicle for innovation in their own institutions thus restructuring the courses. Obviously, this can be regarded to be part of the success story of the project. However no specific details of change were included*

In respect of EUREX it should be noted that from the technical point of view, the project is located and derived from four successful experiences of online distance learning: Urbana 98 :Economica Online: Urbana 99 and the Italian intra university

online seminar, held in Italy within Urbana99 in connection with Economica Online and the University of Naples (ad *hoc* domain on the Urbana server). These courses indicated that the organisational and technological structure (including LMS) proved to be adequate in fulfilling similar aims in respect of EUREX. This might of course merely reflect the infrastructure available to the university sector where joint information infrastructures have long been a feature of this sector, in varying degrees of quality and extent, of course. However it is clear that other sectors like adult education because of historical underfunding and lack of organisational coherence, are burdened by a lack of or uneven development of information infrastructures.

Both EUREX and VIMIMS have been tested over a long period of time and as a result appear not to have particular organisational problems relating to systems integration nor in extending to access outside of their university environments. VIMIMS is able to test the integrated learning scheme presented in its project across a variety of institutions, including universities, technical training institutes, research centres, and secondary school. The project has also consolidated long standing industrial liaisons to function within and as a supporting bridge out into the industrial landscape. VITALAGELL, also benefits from deriving from RAI-NETTUNO-SAT experience, a tried and tested ODL exponent in satellite, internet and multi-media integration. Undoubtedly the special aspect of outreach work in an excluded sector will generate problems of organisational change for this project but there are indications that the flexibility of the existing system will be able to absorb and adapt to any new requirements. Time will tell.

3.2. Staff training
The view that the teachers' role changes considerably with the introduction of computer- and web-based training courses and this change requires tailor-made teacher training in ICT in general and tailor-made teacher training courses in particular is apparent in all the projects.

The AEN project noted: "*Not surprisingly, the role of the teacher "from the sage on the stage to the guide at the side" was at the core of our considerations. Today it appears to be a plain truth that effective e-learning at a distance requires a lot of coaching, advice and communication between teachers and learners. Thus we felt that teacher training has to be a main priority and we therefore set up a lot of activities in the teaching staffs of the partner institutions and integrated teacher training in our work plan. Participating institutes for the further training of teachers contributed in this respect and our own AEN course model for teacher training was developed.*" In AEN special emphasis was put on teacher training and a large number of courses were realized in the participating countries. A joint AEN training model for teachers in adult education was developed by the participating teacher training institutions from Austria, Italy and Sweden]. Various and widespread initiatives were undertaken in in-service training at the participating institutions, in particular in project year 1, Specialised courses in project year to referring to LMS and material development: in project year 2. Goal: enhancing knowledge and skills of the teaching staff at the partner institutions. Additional courses on regional/provincial/national level in co-operation with teacher training institutions. Evaluation: already at the very beginning of the project, even at the time of the application, we were convinced that a thorough and tailor-made teacher training on various levels is the key to a successful implementation of e-learning on a practical level. Therefore these many initiatives

were undertaken. However it was quoted that "as *far as the coordinator knows, the "old" partner institutions pursued their efforts to do teacher training on a broad scale"*. It would be interesting to analyse the AEN model in some detail but no documentation is available at present. And it would also be interesting to find out what the coordinator meant by the above statement which seems to indicate a lack of follow-up.

The ODL Inclusive course is focused on teacher training in the field of inclusive education. The instruction of teachers and tutors for handling the course is done by starter seminars at the partnering institutions, with handbooks for the different roles in the course and short meta-courses on course-management. Teachers and tutors are able to offer a course based on the LMS. Clear strategies for on line teacher training have been presented by this project. They made the point that there is no general strategy for online teaching and the uniformness of e-learning platforms suggests that a given toolset is sufficient for the implementation of any course. They consider five issues as crucial for the successful use of online courses in teacher training which include: learning and working in groups: rich student activities: guidance by tutors and teachers: integration of face to face seminars and classroom and field work examples and tasks. Online education cannot avoid the need for integration of real contact and field work from local and regional settings.

ISU - The only training the tutors had was a course about the LMS system which was offered to all college employees. For EUREX, training or "socialization" to the technology is undertaken at the inception of each new seminar. VITALAGELL training is embedded in the sense that course content development is done by tutors who are familiarized with the technology and the architecture of the media. No information was available as yet on VIMIMS.

3.3. Main actors, adopters/resistors to the adoption of any innovation identified within the project

It was clear that where staff perceive the technology as in some way threatening their jobs or significantly adding to their workload serious obstacles present themselves to implementation. It does seem that current systems are best suited for courses with a high percentage of presentation which means that they are easily adapted to technical subjects and subjects with high degrees of facts and fixed information. It therefore is easier, although not problematic to adapt these kind of courses to on distributed presentation within existing structures. ODL Inclusive noted that integrating existing curricula (INTEGER/EUMIE) makes it easier for an institution to absorb the course into their curricula.

3.4. Organisational conditions (un)supportive to innovation

Within the adult education and school sector implementing and servicing electronic learning management systems is extremely difficult and often cannot be sustained within existing organisations. A very important point has emerged that is related to the need for experimentation and testing and which does have organisational implications. Current e-learning systems and platforms show a wide variety of systems based on different paradigms and emerging standards: most systems have a very specific focus and feature set. The ideal situation would be to develop the whole content and the course structure, devise all tasks for individual students and groups with the appropriate evaluation procedure and then survey and select existing systems

and choose the appropriate platform. As noted by ODL Inclusive this approach is impossible within the required results and funding structures for Socrates projects. Most organisations particularly outside of the higher education sector cannot afford either in terms of investment or time to allow that kind of in house activity. The indications are that extra or supra entities are necessary to ameliorate the rigidities of existing organisations in this respect.

The outsourcing of the tasks required was often necessary including the development of content. Higher education structures, whilst maintaining rigidities, however do have large joint information infrastructures which often operate nationally and internationally and have done so for considerable periods of time. This allows for considerable support for students and teachers in accessing and manipulating new technology and in wider opportunity for customised content development. In view of the difficulties noted particularly within the adult education projects there seems to be good reason for investigating how large scale information infrastructures could be developed at regional, national and international levels.

The experience of AEN highlights this problem. Rapid technological development required a new orientation in the project and the work plan. Within the contractual period (1999 - 2001) several adaptations had to be made, as more and more electronic learning management systems appeared on the market which made "home-made" web-based solutions not only look unprofessional but also unsatisfactory. The presentation and evaluation of electronic learning management systems (LMS) supported the decision making process of the participating institutions as the priorities were set upon the development of evaluation criteria and the reliability of LMS in the daily practice]. The lack of standards and evaluation criteria in educational software and electronic learning management systems is still noticeable and makes decision-making very difficult. Beyond that it also turns out to be an obstacle on the way to convince teachers to use ICT for their ODL-classes and it was hard to develop feasible incentives for teachers to start using the technology and in the beginning the project was regarded as the *teachers' enemy*. Technology issues and services should be "outsourced" to specialists but there are cost implications in this.

On the other hand, "quick and dirty products" – tailor-made interactive assignments - are gaining more and more importance as they rather correspond with the teachers' needs and approach rather than highly professional and complex multimedia material, designed for the leisure-time market and not for courses aiming at a qualification level. Copyright issues (sound, pictures and texts) still seem to be unsolved for teachers and the insecurity in legal terms makes them withhold material they have developed. A solution at the EU-level is urgently needed. A requirement for a stricter standardization of distance learning courses is noticeable compared to the traditional classroom teaching.

3.5. Cost effectiveness

The issue of cost effectiveness is not really addressed within the projects and this may reflect the nature of the requirements of the funding programme from which they receive funding. It is clearly the case that many of the projects required technical outsourcing and the use and testing of commercial products but in no respect does the funding authority require any kind of business plan or indicative costing that specifically addresses this issue. The projects are not funded under a pure research

programme but clearly the projects involve to greater or lesser degrees research functions with their main aim of practical outcomes. It is unclear how projects funded under this programme can effectively address the issue of cost effectiveness.

Cost effectiveness can be achieved through joint working and sharing of infrastructure and by entering into contractual arrangements with commercial and other entities. Within the university and higher technical sector clear analytical frameworks for cost analysis exist and this is particularly so with the further development of the joint information infrastructures that most European universities operate collaboratively. This area is extremely opaque for other sectors.

AEN noted that they were obliged to develop their own learning material as they were dissatisfied with the commercial products available. Cost effectiveness has not been discussed in the project and it was not given a high priority. ODL Inclusive found that the costs for the establishment of the contents were covered by the EU-project but that institutions had to share the technical infrastructure required to offer the course. It was hoped that training costs would be covered by tuition fees but there was the issue of maintaining adequate payment for teachers and tutors offering training to students not enrolled in their own institutions. Little indication was given of any notion of what student numbers would constitute cost effectiveness. I-S-U noted that high-quality video content which was produced by professionals was very expensive to produce and that it is hard to justify such investments. It was not cost-effective to use a professional television team to produce course content with the number of students on the Master programmes. The videos become too expensive.

EUREX did not discuss cost effectiveness. VITALAGELL also did not raise the issue of cost effectiveness. VIMIMS however noted that the cost effectiveness of distance learning using new technologies was perceived as an important factor for companies, if it could be demonstrated.

3.6. Flexibility
All of the projects indicated the achievement of flexibility for their target groups was an objective and all of the projects indicated this in presenting different versions of courses customised to specific settings and with different degrees of access and communication.

3.7. Accessibility
The ODL Inclusive project indicated a fundamental problem with the access of blind people to the course, since almost all practical examples are based on video and observation. These cannot be made accessible by transcripts because the observation tasks do not apply to the transcripts as well. In other respects the e-learning framework by itself complies in most parts to WAI standards.

Distributed learning can meet the needs of people at a disadvantage (geographical reasons, un-regular working hours, social reasons):

4.   Socio-Economic aspects of the innovations
4.1. e-learning standards (refer also to 3.4)
More extensive comments are made above concerning this area.

ODL Inclusive noted that the chosen LMS in its current form did not comply completely with e-learning standards. The implementation of SCORM and AICC is currently under development by Hyperwave, but this can only be implemented within a possible follow-up project of ODL Inclusive which they have so far not been successful with. They did not have the resources to restructure all our current work.

In ISU the project has not been engaged in any work regarding e-learning standards.

The AEN project pointed out that standards could be beneficial for exchange of learning material and services and that agreed standards would make it possible for teaching units to be used in any LMS system.
This area was not addressed specifically in EUREX, VIMIMS or VITALAGELL. although it is clear that all were using platforms which presented no problems for them in the sectors and areas within which they were operating.

4.2. Globalisation
ODL Inclusive builds on existing European curricula, so it provides basic support for cross-institutional certification. All modules will have a clear outcome in terms of ECTS-credits based on the evaluation process by autumn 2003 and he course will be available in English and German – a Czech and a Dutch version are under development.

The ISU project revealed that there is an interest for international collaborative programs but after the initial phase, however, the project discovered that there might be different agendas and vicarious reasons for collaboration. At this stage, two of the partners withdrew from the project, although it is not clear why. The project sardonically noted that it may be thought that institutions are primarily interested in collaborative efforts if they recruit more foreign students to their home institution and not place any of their students abroad and Norwegian institutions are especially interesting as "partners" since Norwegian students pay higher tuition fees than students from EU countries.

In AEN, it was felt that the international co-operation in the huge partnership has actually worked. The exchange of experience, information and know-how provided in the project favored and initiated the implementation of open and distance learning on the national as well as regional level. The exchange of example materials among the partners and their usage, however, was greatly hindered by the language barriers across Europe. This limited cooperation and exchange of materials to language-learning and *made us envy the Anglo-American* countries where material developed by one partner can be used by hundreds of millions. The AEN project felt that it contributed to the eLearning initiatives in the participating partner countries with practical concepts to meet the challenges of the ambitious goals formulated by the Lisbon European Council 2000 and by the European Commission 2001 in the eLearning Action Plan 2001.

Although not foreseen by the original EUREX proposal a publication of written lectures both in English and Italian will be made available at some point. A section of material from the seminar will be freely accessible to all *surfers* to widen the dissemination potential. Topic related discussion lists and forums on the web are informed about the seminar. Exploitation plans were related to the outcome of the

pilot project and are aiming at establishing a European Master in Urban Social Exclusion Analysis. The funding of the project until 2006 facilitates this. The EUREX on-line seminar is well suited to wide dissemination because it combines the possibility of access to overarching theoretical frameworks in the field of urban development whilst offering a virtual architecture to test those frameworks in localised and regional settings. So it can be used, tested, observed and customised in China, Indonesia, the suburbs of Los Angeles, Kuala Lumpur, Manchester or Bergen. The content of the seminar, the recognition and implementation of devices for "seeing", recording and understanding local urban processes indicate that this seminar could easily find a place within the hugely expanding ODL markets in China, South Asia and elsewhere outside of the EU. The same can be ascribed to both VITALAGELL and VIMIMS. The latter especially so because it promotes a well established scientific and technological discipline with universally accepted standards. VITALAGELL is more complex because it is located in a precise pedagogic model derived from Eurocentric research about ageing – a model not necessarily appropriate in Japan or among the elderly in the foothills of Laos where 74 year olds act as jungle trackers displaying physical and mental agility quite beyond what is expected of their peers in Europe. In this respect the issue of so called "globalisation" is contested because of important methodological and cultural questions. Scientific and technology content courses appear less problematic as do all courses which present "facts" – and as such can easily find a place within a global ODL marketplace. It is not the case that a "European" view, often derived from an "American" practice in appropriate methods of teacher training is either suitable or interesting to teacher trainers in Asia, Latin America or Africa. They may be interested in issues raised but their concerns will be to develop content and systems appropriate to their unique socio-economic and cultural determinants.

4.3. Other socio-cultural factors influencing learning processes

Clearly issues of varying cultural and language backgrounds, demography and gender are of significance. Intercultural awareness can be developed through distributed collaboration as information and experience are exchanged about local environments, structures of institutions and civic and cultural protocols. Multilingual presentation is not a problem at one level. It is the enormous resources required to transform and translate content into a range of languages. It is however unclear that where partner institutions operate within a limited international range and where there is little previous experience of different cultures how within projects such as these there is enough time for analysis of, reflection on and experience of differing cultural biases.

4.4. Funding & commercialisation

This is a hugely problematic area which has been touched on above.
It has been indicated by AEN that students in upper-secondary adult education usually do not have the financial means for top-level IT-equipment and fast internet-connections – the students' equipments set the standard for practical work with ICT. Implementing and servicing electronic learning managements systems (LMS) has proved a task far too ambitious for an average sized school: Running a server with a LMS has to be outsourced and serviced by experts to guarantee a reliable and working system, including a hotline and support for teachers and students alike. This is expensive.

ODL are currently negotiating with publishers to be able to offer the course on a commercial basis. But this is no more than an option at the moment. The view of ODL is that economic potential is based on the ability of institutions to charge tuition fees.

In ISU, the Building Surveying and Real Estate Economics program will be offered as a commercial program in the future and such commercial programs as a potential source of extra income.

4.5. Implications for LLL

The ODL Inclusive course will be offered for in-service training, so it is clearly devised for lifelong learning. It is hoped also that the emerging learning communities will develop a lasting relationship that enables them to manage their own further education together. The second outcome of the ODL project – the experts exchange platform – is seen to be a means of intensifying this cooperation on a lifelong professional basis.

In AEN the contribution to the concept of lifelong learning is seen in the project's focus on adult learners and in particular on how to ease the access to education and training for them and thus contributing to social equality. The AEN project contributed to the European concept of lifelong learning by its practical approach in adult education. Thus the co-operation on a European level and the development and implementation of practical concepts supports the demand for enabling European citizens to become digitally literate and to bridge the gap between those who have access to new technologies and those who are excluded from the knowledge society.

EUREX - This is problematic as the seminar is clearly located within an elite European academic environment. It is monolingual in that all process is conducted in English. Total access is subject to selective registration and fee paying (although all students accepted receive fellowships) Registration currently costs 250 Euros. Admission requirements are clearly stated as: Late undergraduates (just before their diploma) and early PhDs (in their first years) in social & political sciences, humanities, liberal arts or economics, geography, urban planning etc: Outstanding academic results and/or rich professional experience: Evidence of a good working knowledge of English (possibly correspondent to TOEFL score of at least 550 points or to an IELTS score of at least 6.5): Full internet access: Strong motivation & professional or personal interest in participating in a European online distance course on the issues at stake. It can be noted that the design of the EUREX project allows disadvantaged groups (e.g. disabled) easy access to the seminar via IC technologies. Participant institutions are not barred from using material in local languages if they choose in their own environment which meets the "trickle down" notion. Costs of translation are a factor.

With VIMIMMS, any internet user can freely access the homepage which contains descriptive and promotional materials relating to the project, to the partners and to the EU Minerva action: two links as registered and anonymous user (guest) are available to access the Virtual Institute. This provides a continuous source of reference, state of art in specific discipline for practitioners and professionals. This is a trans-European project by well-established practitioners in a specific discipline with courses customisation to the learning patrimonies of participants. While developed and tested

in a university environment the project also addresses industry needs. There is recognition of the fact that over the last few years an increasing interest in distance learning technology can be seen in the industrial world in order to maintain the skills and competences of employees and to help the merging of knowledge acquired in different places. In that sense it contributes to professional lifelong learning. Other potential users of this environment may be persons interested in increasing their skills independently and established practitioners interested in keeping up to date with state of the art.

With VITALAGELL successful validation of the pilot project could speed up a new innovative approach to the Lifelong learning educational dimension for this specific socio-economic group. In fact the pilot project after being tested on the target groups is intended to be used across Europe to try to spread not only the final outcomes through the web site but also to introduce a large number of people to new technologies. It is assumed that the pilot will have a deep impact on the target groups and consequently lay the basis for extension across Europe. The final results will be disseminated around Europe through Internet and satellite TV transmission.

5. Innovation defined: sustainability & diffusion
5.1. What was considered innovative
Innovation, if it is has been considered, is less viewed as encompassing the technology but more in terms of the content developed or specified target group. For ODL Inclusive it is contained in the attempt to develop a collaborative knowledge pool encompassing the field of inclusive education. For VITALAGELL, the innovative dimension seems to be fulfilled using a multimedia integrated platform made of videolessons, web site, chat rooms, forums of discussion, face to face and distance interactive tutoring to demonstrate the validity and the effectiveness of the ODL NETTUNO model for the target group involved. In large measure the "innovation" is perceived as the group at which the integrated multimedia is aimed. In EUREX the technology merging of sociology and photography as a device for seeing and understanding local urban processes within the field is perceived as innovative and significant in terms of disseminating knowledge and archival collection in and of local urban environments. The use of IC technology allows a means of addressing the recognition of difference literally by "showing".

5.2. What was the role of ICT in the innovations
All of the projects included: Online course material to be used by the individual student: Rich media (mostly video) to present insights into classroom or other field work: Exchange with peers, tutors and teachers in structured forums: Live communication in working groups (chat-based): Group work in projects based on workspaces: Experts-exchange on specific problems (problem solving approach). This is clearly shown in the EUREX model. The interaction via chat (synchronous) or via forum (asynchronous) is perceived as creating a new learning community, exploiting the new IT and allowing debate on precise issues addressed in the written lectures and in the reading material. These relatively new medium are seen to partly modify the interaction rhythm and the way contents are presented. Both students and scholars go immediately to the information/communication point and what are termed shy students are expected to participate more actively to the interaction process. The notion of co-production seems underpinning in that scholars - tutors- students proactively function together in the "learning process".

5.3. Were the innovations sustainable/scalable

Sustainability is dealt with in some of the projects in the sense that indications are given that networks are being set up to maintain long standing distributed collaboration. Within the adult education projects these have a voluntaristic aspect. VITALAGELL and VIMIMS like EUREX appear to have sustainability and scalability embedded and this may be due to the fact that all these projects derive from already well established operational practice. EUREX in particular, within its clearly defined remit, is sustainable and is currently embedded in at least 14 European universities.

Higher Education sector

Introduction

Within this sector DELPHI analysed 6 MINERVA projects: BENVIC, SETTT, NETCAMPUS, CLIENT, SEUSSIS and GALECIA. All the projects belong to the 1999 Call; they started in the year 2000 and finished around 2002. The projects as a whole produced a large amount of documentation: projects' reports, books, papers, articles, etc., although there are quite remarkable differences in what respect to the documentation available by each project. This fact will be reflected in the analysis of the projects; those projects rich in documentation have been thoroughly analysed; in all projects we took the Final Report as a key document.

This report aims at providing a review and synthesis of the results of MINERVA projects focusing particularly on the innovations implemented.

The review and synthesis was focused on the following questions and parameters:

1. What are the new methodological approaches to learning in ICT-based learning scenarios?
2. What are/were the main institutional/organisational changes as a result of ICT and ODL implementation?
3. Socio-Economic and socio-cultural aspects of the Learning Innovations

1.   Scope of the projects reviewed

The projects of this section were classified as part of the Higher Education Sector, including also the collaboration of Universities with the private sector; so most of the results of the analysis must be contextualised within this sector. However many of the phenomena is present also as we will see in other sector analysed by DELPHI.

BENVIC aims at providing decision makers with systems for evaluating *Virtual Learning Platforms* that will allow them to improve their development as well as get to know other platforms better; benchmarking for the establishment of quality criteria is the final purpose of the evaluation of virtual campuses. GALECIA takes a different point of view but complementary in some way to BENVIC, looking at evaluating the implementation of multimedia, ICT based material when applied to different courses, with distinct methodologies, ODL schemes and cultural realities.

SETTT focuses on the implementation of ICT and specially virtual learning environments in the strategic planning of Universities for its implementation, while

NETTCAMPUS intends to identifying a comprehensive list of all critical factors of networked e- learning, by surveying the most relevant networks and to determine the key factors that allow them to provide benefits and to solve problems of networked e-learning. The project CLIENT aims to improve the understanding of the impact of open and distance learning models on the organization of the learning process. The project addresses collaborative learning on the basis of a problem-based approach and specifically focuses on the impact of the international context of the learning process. Finally, SEUSSIS looked at experience, skills, confidence and attitudes of students and academic staff with respect to ICT in order to do a comparative study about ICT skills students acquired during their studies and their future needs in this area. Quality was also a concern.

1.1. Definitions of e-learning in the projects
Implicit definitions of e-learning and other related terms are of upmost importance for the understanding of the projects conceptions and results. Interesting is to notice that projects have a different viewpoint   when looking at e-learning: concepts as virtual learning, virtual campuses, e-learning, networked learning, etc, are in many ways contradictory and complementary. They share some dimensions, but in fact the starting point differs on interests of institutions and of problems to solve. For instance, for the project NETCAMPUS e-learning is seen as:

> *"learning supported with the aid of all kinds of information and communication technology (ICT). We do not restrict e-learning to only using the Internet for didactical purposes in higher education, as is often the case. Also more traditional media, such as video, audiocassettes, television, radio, telephone, CD-ROM, or even satellite communication are envisaged as well. A shift is made away from the scenarios as a basis for problems, to a more-abstract matrix in which problems are classified in terms of their nature (attitudinal or practical) and their basis (pedagogical, technological, organisational). (final report, p. 6)*

For this project ***networked e-learning*** *(more than the two direct partners, teachers and students, are involved)* could be that students at different universities in different countries establish a learning community and take the same courses, collaborate on the same projects and communicate in a sophisticated virtual way. It could also mean that teachers across institutional or national borders find each other and jointly develop courses, share learning material and divide the tutoring activities. It could include far-reaching collaboration and policy making amongst institutes of higher education on the educational use of ICT at the highest strategic level. It could be of interest to other parties as well, such as financial institutions, local municipalities, NGO's, etc:

> *Networked e-learning should not only be defined as learning through the Internet, although it is certainly of utmost importance and probably the most obvious and most visible format. In this sense we subscribe to the definition of the European Commission: "The use of new multimedia technologies and the Internet to improve the quality of learning by facilitating access to resources and services as well as remote exchanges and collaboration."*

Whereas for the project BENVIC, virtual learning is an idea that is close to managerial higher education matters. This can be seen in the definition of VLEs:

The Virtual Learning Environment is a framework, which will incrementally integrate all of the academic businesses of the institution into a coherent whole through the use of ICT. The system must ultimately deliver a significant improvement in the manner in which the institution conducts its business.

For the project BENVIC, e-learning is closely associated to the virtual learning in general and to the organizational and delivery system, the virtual campus. For this project a virtual campus:

a concept of Virtual Campus does not simply means a technical platform, a piece of software able to support leaning-oriented communications and access to learning resources. It looks at Virtual Campus (virtual learning environment) as "a specific format of distance education and/or on-line learning in which students, teaching staff and even university administrative and technical staff mainly meet or communicate through technological links". Educational institutions are applying new information and communication technologies in different ways, but if we analyse the most important necessary variables for the describing of any model, we shall see that three appear. Each one of these major models is based on the protagonism of one of these variables: the student, the teaching staff and the technological means

In the next sections, we look at the key categories that were part of the analysis, and the parameters that are of interest for this research.

2. New methodological approaches to ICT-based learning innovations

2.1. General pedagogical issues

As usual, there are different approaches in the development of the project, or supported by the projects. Inn any case all the projects suggest that the introduction of educational technologies necessitates a comprehensive remoulding of the pedagogical process. The web and the Internet are indeed technologies that require a fundamental rethinking of teaching practice. There is certainly a need for new pedagogical models and the optimisation of existing ones. The use of classic didactical models in the new environment is not advisable. Also methods of evaluating and verifying learners' participation have to be reconsidered.

It is of utmost importance, and maybe previous to all pedagogical innovations the mapping out of ICT skills students and teachers need, no only at the current time, but in the near future (SETTT). The university may wish to bring about quality improvements in student learning by putting in place more effective measures calling for the use of educational technologies. This may involve access to external information sources, the setting up of monitoring and individual tutoring and the development of on-line modules, the development of complementary and support courses for traditional courses. Examples of complementary work could include supervised work sessions or practical workshops, examination practice and optimising the use of lecture space. In addition to this the institution could consider the development of systems for validating knowledge or accessing European courses through video-conferencing. All of these elements could potentially improve the quality of learning at the institution.

The university may hope to become one of the leading institutions in these teaching techniques. This could involve the putting in place of an internal communications infrastructure, an intranet linking all of the constituent parts of the university, students, staff and other university personnel. It will also require the development of new learning methods, supported by opportunities provided by educational technologies (distance monitoring and tutoring, accessing courses through the use of video conferencing, a choice of on-line courses, accessing valuable research documentation).

The case of virtual campuses is of particular interests. The pedagogical approaches within this particular delivery and organizational system lies in new pedagogical interests, as for instance the creation of an educational community, as a group of people with similar interests who are able to relate to and collaborate with one another (BENVIC). The standard methods of pedagogic evaluation that rely heavily on the use of psychometric-based instruments to measure ability and achievement that are found to be culturally biased, and to place undue emphasis on innate ability rather than learning, there is a need to develop evaluation methods that are learner-focused; there is a need for collaborative learning and collaborative evaluation that represents evaluation objectives in terms of stakeholders.

The project CLIENT tackled particular pedagogical problems, those related to collaborative learning on the basis of a problem-based approach, and specifically focuses on the impact of the international context of the learning process. The development of innovative approaches for including innovative summative and formative evaluation approaches which enhance an approach for research into social, organizational, pedagogical and even psychological effects on the learning process was also pat of the pedagogical problems posed.

What are the teaching skills necessary for teaching at a distance? What are the instructional design models used in e-learning? The pedagogy of e-learning is dependent of two dimensions: attitudes and practical matters. Based on these general dimensions, issues related to the changing role of teachers, teaching skills, tutorisation, language and cultural issues, teachers' workload, etc come into action in networked learning in international settings, and in general in e-learning (NETCAMPUS).

The project GALECIA examined and evaluated how dependent of the Learning environment is the multimedia educational material supporting a course. Can we use the same material for different course levels, different student types, and different learning models? How long and how much effort involved in adapting the material to each situation? Does this adaptation depend also on the European regions involved?

2.2. Teaching and learning philosophies
Teaching and learning philosophy underpinning the use of ITC, enlighten any kind of analysis of ICT learning innovations. SETTT mentions some key trends in education and training that frame the analysis of virtual learning:

   a) An irreversible trend towards the concept of "learning".

b) Integration of information and communication technologies into everyday teaching practice.
c) Using open and distance learning to increase flexibility.
d) New technologies are both a cause and an indicator of change.
e) Increasing the opportunities for access
f) The Europeanisation of courses and the use of new educational technologies.
g) New educational technologies are a means allowing well-identified strategies.
h) The need to establish new strategic management.

For Project BENVIC, benchmarking the implementation of virtual campuses (description, evaluation and comparison of all aspects of virtual campuses) implies the discussion of general aspects as guidance, support, authoring, evaluation and other teaching and learning areas which are the foundations of the pedagogical approach of e-learning. BENVIC has noticed on the benchmarking exercise that one factor that differentiates one model of virtual education from another is the type of learning environment it creates. It is necessary to frame learning processes within the particular learning environment of each virtual campus. The benchmarking system has devised an elaborate method for defining and distinguishing each unique learning environment and another one for evaluating learning; at the core is the belief that learning is very complex and difficult to quantify, thus necessitating a set of methods that reject reductionism and oversimplification.

The pedagogical approach of CLIENT addresses collaborative learning on the basis of a problem-based approach and specifically focuses on the impact of the international context of the learning process. Through the establishment of an open, virtual, collaborative learning environment where test groups of students participated in learning modules based on the problem-based approach, an environment for extensive research has been created. An important tool for the research executed in this project was the innovative summative and formative evaluation approach, which enhanced an approach for research into social, organizational, pedagogical and even psychological effects on the learning process.

2.3. Teaching techniques, methods, and devices
The Web and the Internet are indeed technologies that require a fundamental rethinking of teaching practice. There is certainly a need for new pedagogical models and the optimisation of existing ones. According to NETCAMPUS, The use of classic didactical models in the new environment is not advisable. Also methods of evaluating and verifying learners' participation have to be reconsidered.

CLIENT educational model was Project Centered Learning (PCL). By using PCL, students gets a real-life assignment, which they have to solve in a team.

For SETTT in spite of all the efforts, no real teaching method yet exists which is based on educational technology. The models and methods of traditional teaching approaches have been computerised. Research and systematic experimentation need to be put in place to test this.

2.4. Teaching and student roles
ICT has begun to change education by its direct use in learning and teaching, with its advocates holding out the promise of a "new Paradigm" for learning and teaching that

moves form a teacher-centred to a learner-centred approach. In this sense, changes in roles are important for many reasons. One of the key ones is that by knowing the new emergent roles we could talk about a set of competence dimensions useful to develop training programmes.

For CLIENT, the advantage of Project Centered Learning (PCL) is that the students' skills, like presenting, writing, team management, etc. are trained. Also the students learn to apply learned knowledge in a real-life context (student as a team member).

The new methods experimented by SEUSSIS based on virtual platforms as chat rooms or video conferences allow for new roles and interactions: whereas teachers are not necessarily better skilled than students, a common learning process is coming up, where teachers have to share their leadership with more expert students.

For project NETCAMPUS teachers need to adapt their perception of what it means to be a teacher. Faculty who engage in the development and delivery of courses at a distance may find that the roles to which they have become accustomed in a traditional university environment have changed in the online environment. They may find a fundamental shift from a teacher-centred environment in the classroom to a more learner-centred environment online: the role of the teachers changes from one of transmitting knowledge to one of mediating learning, from the role of instructor to the role of mentor and guide.

For SETTT the role of the teacher in virtual learning environments needs to change. He or she needs to assume the role of a tutor, to accompany the student in the process of acquiring knowledge. Such a change is inevitable and will be accompanied by the emergence of new job profiles in the university. Experienced assistants working in the field of educational media and technology could be invited to give their support to academics in the process of integrating these new technologies. Why not even imagine more advanced students taking on such functions?

2.5. Teachers and students interactions
CLIENT reports that new ways of co-operation brought to a totally different interaction between the students or rather partners, which were still accustomed to the elderly methods of teamwork. Building up a team by networking them only by the Internet, without any physical contact, had as result an innovative work basis.

2.6. Attitudes of teachers and students towards ICT
Within this category some projects have tackled directly this issue, whereas within the work done in others we could map out some of the trends.

Attitudes towards ICT and confidence in its use are just as important and perhaps more so, for learning to learn and transferability of skills are now seen as vital in enabling graduates to move beyond their current level without prolonging training, and to take up new opportunities without needing direction. One clear attitude of students towards ICT that is becoming more positive is the increasing importance of ICT as more and more important for their professional career. New students also show different behaviour with respect to the emergence of web skills, growth of PC ownership, etc. For those students with difficulties I use of ICT, it seems influential the attitude of staff inculcating positive attitudes to technology I their students,

through implicit and explicit messages (staff who are under skilled send negative messages to their students). This is particularly important in the emerging use of e-learning, where pedagogical as well as technical issues arise.

Through the undertaken work emerged, that all of the interviewed owned practical experience in matters of computer technologies. But the skills differed between the various Universities. Ownership of PCs and ancillary equipment was high among the students, and they had good ICT skills, as measured by the number of ICT applications that they reported they could use unassisted. Almost all students could handle word processors, web browsers, email and chat. New students had less experience then established students with presentation managers and bibliographic databases, suggesting that they do in fact acquire these skills during their courses. Most of the interviewed academic staff felt reasonably well skilled in use of ICT, although there were variations in age, confidence and gender.

Students are not homogeneous in their ICT skills and attitudes, varying between universities in their skills and gender. The project SEUSSIS noticed that female students were generally less confident than males, and reported fewer skills and lower competence levels. On the other hand their view of ICT to their careers was similar to those of male students. One of the key questions is to what extent these results reflect country-specific experiences, age, gender, or the main subjects students intend to study.

NETCAMPUS has noticed that instructors often have negative perceptions of technology-supported learning and open and distance learning. They prefer a face-to-face learning environment and can't see the educational benefits or the potential of new ICT-based methods. They question whether the Internet can actually be used effectively for educational purposes and resist this new mode of instruction. To deal with the attitudinal obstacles (such as ignorance of the potential of new ICT-based methods, prejudices against ODL as an alternative to face-to-face education, resistance to the changing role of teachers in the educational process, etc.), this project suggest methods advanced in the literature and previous research to sensitize, motivate, reduce resistance, and overcome prejudices with the general objective of evoking an attitude and mentality change.

2.7. Assessment
Assessment in e-learning needs for some projects a special attention. There are many approaches, which reflect different assessment theories. These approaches go from the dominant positivistic paradigm in pedagogic evaluation, to a constructivist-oriented evaluation focused on learner-centered and learner-directed assessment.

For instance for NETTCAMPUS traditional methods for assessment of distance students may have to be pursued. Constructing a rigorous, fair and comprehensive exam is not an easy process, and standard exams cannot be given to a remote audience unless proctoring is arranged.

In online courses assignments are submitted via Internet, but in most of the cases the final assessment is face-to-face based. In other cases the knowledge is assessed continually, and supplemented by limited formal assessments at group meetings (SETTT). If institutions use a commercial product for online learning, they might use

the different types of assessment these tools allow (e.g. Blackboards allow for real-time online conferencing and formative assessment), although this is a sensible issue. software package), although students do not take full online summative assessment with through this method.

Another online institution mentions an assessment system, which had a dual approach. In the first place, the students are continually assessed during their course. In the second place, students are also required to attend a face-to-face, individual assessment at the end of each term. This was intended to give the institution confidence that its methods were working and secondly to reassure a nervous marketplace that quality could be maintained.

Currently some universities are moving towards phasing out the face-to face aspect of its assessment system, but still is soon to ascertain that these systems will consolidate in online learning.

2.8. Teacher workload

Concerns about the workload of using ICT in education seems to be a main obstacle on all levels (pedagogical, technological and organisational). The workload is largely dependent on the subject but also on the potential market. There arises the question of evaluation and certification of the courseware.

For the SETTT project here we have some of the pedagogical worries involving e-learning. The task of preparing a course, which uses educational technologies, is more onerous than a traditional teaching approach. Staff should have incentives when participating in innovations. The integration of new pedagogical methods requires new training policies in the institution and very often the setting up of resource centres to support academics wishing to invest in these new approaches. The university therefore need to give some consideration to this question when new professional profiles appear in the university. The university will need to put in place a policy recognising and validating academic cooperation in the setting up and development of educational technologies: financial, career, responsibility for leading research groups, scientific and administrative responsibility (directors of study departments etc), lightening of the teaching load for academics engaged in a development project.

For NETCAMPUS incentives and guidance for any instructors involved can be provided, (again, this guidance can be partly handled at the network level); for example, incentives for faculty members to spend extra time and energy in developing material, etc. and incentives and support for engaging in technology-mediated learning and developing tools and course materials for the distributed learning environment.

2.9. Teacher collaboration

Teacher collaboration is not considered or supported generally by universities (SETTT). European universities fail to encourage their academic staff to integrate ICT into their teaching, and no investment in these approaches is taken into account in an academics career profile, which thereby restricts academic collaboration with relevant research projects.

Universities and teachers can only create the necessary high quality learning materials and services by joining their efforts and resources. From an institutions and teachers point of view the use and sharing of international resources is a considerable advantage and result in economies of scale. (e.g. exchange, sharing of learning material and courses, seminars, access to the equipment, laboratories of other institutions, etc.). The creation of a database for reusable learning and teaching materials will get a far greater number of entries, and its maintenance may become more cost-effective by sharing costs and income. It helps capitalisation of 'teaching acts' as reusable learning resources. A university network should also certify-accredit each other's websites and collaborate in the development of a directory of reliable learning websites.

In online networked online learning new degrees of collaborative work between geographically disparate teams are possible. Staff has the opportunity to work collaboratively and closely with colleagues.

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

3.1. Main institutional changes resulted from the introduction of ICT and ODL into existing structures

Universities are undergoing fundamental changes, as sources of knowledge; they are tasked with mass education programmes in their undergraduate programmes. In addition to this, they are under considerable pressure to create vocational streams. Knowledge in itself is not enough, education must lead to employment and the mission to ensure vocational education includes the responsibility for maintaining it and for developing it within a framework of continuous learning.

Faced with this recent turn of events, for SETTT, universities, which do not have a monopoly on education, have had to open their structures to the outside world. They need to be capable of demonstrating their scientific credibility at an international level but also have to respond to drivers from the industrial, social and cultural environments.

In such a context, information and communication technology (ICT) appears today as one of the most appropriate tools. It affords the possibility of allowing everyone to learn, when he or she wishes it, whether as part of initial or subsequent learning.

Networked and computer-based learning cause an increase in costs for the organisation: costs to develop and deliver online courses, the cost for the technical infrastructure (e.g. connectivity, network access, etc.).

3.2. The role of staff training

From many points of view, teacher training is recognized of utmost importance:

a) for developing multimedia materials: New ways of working therefore should be devised which put an emphasis on the exchange of knowledge and skills between different specialists in support of the new pedagogical project. It will almost certainly take a few years before this changed paradigm can be really put in place

b) for integration of new methodologies: Universities should re-think their recruitment systems, the on-going training of both academic and administrative staff, but above all their promotion criteria

For SETTT any strategic ICT implementation plan needs to consider teacher training. The university will need to give some consideration to this question when new professional profiles appear in the university. Universities should re-think their recruitment systems, the on-going training of both academic and administrative staff, but above all their promotion criteria.

In e-learning to be hold some specific technical skills is a necessary condition. For project NETCAMPUS, the lack of technical background, lack of basic computer literacy of the students as well as of the instructors, and lack of technical support are obstacles to introducing ICT in education. Because of this lack of technical skills, ICT is used at a level below potential (e.g. websites that are merely textbooks-on-screen). One of the consequences of that is the need for staff training (also students training) in the different tools and learning environments, at the level of users or content designers.

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

In e-learning innovations, we should bear in mind that resistance arise when these are not part of the regular courses. Short time for the innovation to consolidate and knowledge are also constraints(CLIENT).

Another project rise the issue of the lack of technological background of the lecturers, and the missing functionality of the used software used. Resistance appear for these circumstances. For NETCAMPUS, many instructors and students do not like to learn how to use a new electronic learning environment. Lack of technical background, lack of basic computer literacy of the students as well as of the instructors, and lack of technical support are an obstacle in introducing ICT in education. Because of this lack of technical skills, ICT is used at a level below potential (e.g. websites that are merely textbooks-on-screen).

For SETTT resistance to change by academics and administrators is without doubt one of the most important factors encountered in institutions. The most obvious and certainly the most important change in the overall process concerns the future role of academics as well as students. The former will no longer only have to transmit knowledge but from now on they will have to teach how to learn. In the same way the student will have an active and driving role in the process of learning. It will be necessary therefore to define what some people call a new educational contract between the different partners establishing the rights and responsibilities of each one.

3.4. Organisational conditions that are (un)supportive to innovation

NETCAMPUS provides with some of the key aspects to taking into account for higher education institutions in order to implement successfully e-learning and/or virtual campuses:

Access to local facilities. In a distributed environment it is a challenge for the university to making library resources available for distant learners and giving access to e-libraries is an important issue.

Timing: Co-ordination and planning problems may emerge because of learners and teachers working in different time zones.

Registration: Institutions offering programmes across countries should take care of some administrative problems.

Payment: Registering for a course usually implies payment.

Security: When all contact and communication between universities, teachers, and students is happening through the web, security becomes an important issue.

Infrastructure/access: students can be frustrated by the computer and network facilities available to them or by features in the electronic tools they are being asked to use.

Financial aspects: Networked and computer-based learning cause an increase in costs for the organisation--costs to develop and deliver online courses, and the cost for the technical infrastructure.

Accreditation/credit transfer: courses attended at another university or offered by a consortium on line may not be accredited in the student's home university.

Copyright – intellectual property: The creative effort of the academic staff should be protected from copying, use and sale elsewhere, keeping the different national legislations in mind.

Competition: Universities face a significant and growing competition from other and new types of e-learning providers.

Networking: Gives opportunities to universities to collaborate not only on the design and development of courses but also on the delivery of courses, and on Internet or web based education materials and curricula.

For BENVIC, the institutions need to elaborate a "map of competencies", which gathers together the basic criteria to be kept in mind in any evaluation of virtual learning environments. The map of competencies is the result of identifying and analysing all the competencies required by an institution in order to define, implement, manage, and evaluate a virtual campus from the educational, technological, organisational and economic standpoints. BENVIC proposes three types of indicators: structural, practice and performance indicators. The aim was to develop a set of Meta-indicators which are as simple as possible while sufficiently detailed to mirror all particularities of virtual learning organisations that need to be characterised. These are:
- Learner Services
- Learning Delivery

- Learning Development
- Teaching Capability
- Evaluation
- Accessibility
- Technical Capability
- Institutional Capability

As with respect to *organisational constraints* and practical obstacles, these come from analysing the local situation in measuring and comparison with other institutions, as BENVIC proposes. NETCAMPUS include the need for new pedagogical models and the optimisation of existing ones, the (non)availability of and/or lack of compatibility between technical infrastructure, copyright issues, language problems, quality control and credit transfer.

3.5. Cost effectiveness

Working together can generate economies of scale, e.g. joint research and development (and even investments) in technology and infrastructure and joint marketing of courses. Where pedagogy of ICT based education and training is still largely missing, well-balanced joint research can lead to faster and better results. Networking can help the ODL institutions in overcoming the problem of professional marketing and sales of their educational and training services, which is precondition of reaching the "critical number" of learners, sufficient to cover the cost of development and delivery of quality courses. It may enlarge the 'customer base' of a university and facilitate international promotion as well as acquisition of relevant competencies and know-how from partner universities. Functions such as the development and distribution of learning materials, tuition, assessment, online registration and record-keeping, award-granting, learner support, and general administration can now be shared through a wide variety of organisational arrangements marked by specialisation and "added-value" partnerships involving both the public and private sectors.

For NETCAMPUS, online learning can be at least as cost-effective as face-to-face teaching. Moreover, the development of virtual delivery models will most likely result in a higher degree of cost-effectiveness and a cost reduction. Costs can be reduced through standardisation, resource sharing, economies of scale, increased productivity, and by purchasing hardware and software jointly. Additionally, travel costs can be lowered.

The implementation of Open and Distance Learning (ODL) in a networked environment offers a great potential, such as flexibility, course development, or cost sharing. But, in spite of the various efforts that have been invested in the different e-learning networks, there is still a great reluctance to embark on large-scale activities that are self- sustainable and permanently embedded in mainstream education.

Also funding can be attracted more easily where several universities come together and pool resources for maximum impact. Distance education programmes can also be not only self-supporting but can generate additional funds to support other departments at a traditional institution.

SETTT studied the economic aspects of setting online education in Universities, given the fact that the development and use of educational technologies involves the institution in considerable cost where the acquisition of materials and the conception of products are concerned. In a great number of situations in universities, one of the key elements put forward for not investing in new educational approaches concerns the cost. The analytical frameworks for proceeding to cost analysis can vary considerably. The university needs to be capable of:

- Carrying out an evaluation of its technological infrastructure, both internal and external
- Knowing all the initiatives that have been taken in its institution to develop new educational approaches
- Putting in place a benchmarking system in order to have a better knowledge of what is going on elsewhere and at what cost
- Carrying out a first cost analysis by combining direct with hidden costs

Direct costs to analyse:
- Cost of materials (servers, PCs, peripherals etc)
- Cost of software Costs of network infrastructure
- Costs of communications Cost of maintenance and updating
- Staffing costs (technical staff managing infrastructure and cost of those responsible for the development of projects)
- Cost of tutoring
- Cost of technical assistance
- Staff training costs
- Costs of consumables (cables, diskettes etc)

In this context, the life expectancy of equipment and cost of replacement need to be taken into account.

Other indirect costs to be taken into account: Time spent by academics learning the educational technologies.

3.6. Flexibility
Flexibility is a key word in e-learning. For project SETTT, flexibility is understood in many ways:

- flexi*bility of the tools selected:* Web portals are the newest delivery mechanism for providing information to users in an institution, the key advantage of a portal over other solutions being its flexibility. Institutions will customised it to suit them and furthermore, it will be very quickly alterable to suit differing sets of circumstances.
- *Students access:* The intention of this plan was to improve quality of service to their existing students and increase flexibility of access in order to build new markets for their course offerings.
- *Curriculum*: One major challenge which teaching institutions will face during the coming decade, most especially in higher education, will be the transition from traditional institutions with fixed courses and relatively stable programmes towards organisations where flexibility will be the central element.

- *University structure:* A particular feature of the Napier approach has been its emphasis on flexibility. In the development of its new operational model, it has striven to cater to a much wider range of students, and also to implement a much more flexible access provision for these students.
- *Course management:* Online teaching increases the teachers' flexibility with regard to time and place. Teachers appreciate this, but on the other hand they realize that online workload is higher.

3.7. Accessibility

Access, and more specifically online access is understood also in many different ways:

- Access to online learning services
- Access to a vast amount of knowledge, instead than access trough the teachers
- Access of tools as freely available software
- Access to training products and materials
- Access to information to everybody

4.   Other socio-Economic aspects of the innovations

4.1. E-learning standards

For NETCAMPUS content and technical standards need to be adopted that will optimise interoperability with other institutions in areas such as the creation of learning databases, information databases such as libraries, administrative systems and learner support strategies as well as the facilitation of interactions among learners and teachers. Building an educational repository that provides access to learning objects requires standards and structures that can facilitate object storage, retrieval and aggregation to suit the needs off learners or the pedagogical intentions of instructional developers. Campuses should consider whether they are positioned to provide the requisite technological infrastructures, to create alliances   (it is inappropriate that everybody develop their own delivery platforms).

Content and technical standards need to be adopted that will optimise interoperability with other institutions in areas such as the creation of learning databases, information databases such as libraries, administrative systems and learner support strategies as well as the facilitation of interactions among learners and teachers. Building an educational repository that provides access to learning objects requires standards and structures that can facilitate object storage, retrieval and aggregation to suit the needs off learners or the pedagogical intentions of instructional developers.

LMS Learning Management System: generally speaking it refers to management systems for open distance education elements offering the following functions: course management, creation of personalised courses, flexibility in monitoring the course (management of planning and resulting content), individualised tutoring or mentoring.

There has been a move to produce standards for Instructional Management Systems. This initiative, the IMS Project (www.imsproject.org) has led to a comprehensive set of guidelines, which relate to the interoperability of computer systems in the educational field. According to SETTT, several standards currently exist in open

distance education: AICC, SCORM and IMS for example. They are intended to ensure systems' portability (compatibility), reusability, and interoperability. Educational resources must be able to operate independently of all software platforms and presentation.

4.2. Globalization

Another factors are globalisation and competitiveness. Universities face a significant and growing competition from other and new types of e-learning providers. In the higher education market traditional universities not only have to compete more and more with other universities but also with virtual and commercial organizations and companies, all offering the same type of courses. A possible decrease of institutional or "brand" loyalty must be considered and may redefine the relationship between a campus and its students. Institutions enter an international and competitive marketplace. Institutions perceive that ICT will enable them to increase their market share and to extend its influence.

The e-education market, particularly in higher education, has grown considerably in the last years. With globalisation, one questions whether the very survival of institutions is under threat. Will it be necessary for institutions to be able to provide credible education in huge marketplaces where new technologies will enable universities to increase the number of their customers?

For SETTT, from now on, the concept of productive organisation will be indivisible from that of the learning organisation. This calls into question the organisational and human resources of any economic entity and highlights the need to think and develop new mechanisms for the transmission of knowledge and know-how. Our ability to integrate and accept this new paradigm will largely depend on our competitive situation in the world. In a situation, which is based on the globalisation of trade from now on, communication will be a determining competitive factor.

Paradoxically globalisation generates a requirement for stronger local strategies and policies. Increasingly, knowledge and information are the driving forces behind the new social structures. Consequently, the objectives of education and training systems will need to be shaped to cope with the rate of change. Universities are undergoing fundamental changes, as sources of knowledge; they are tasked with mass education programmes in their undergraduate programmes.

4.3. Other socio-cultural factors that influence learning processes

The main socio-cultural influences between the different countries with respect to the use of ICT come from different aspects. In project SEUSSIS they report the differences come from the varying cultural and language background, also from ICT skills and attitudes, varying between universities (so countries), age and gender. Nevertheless, despite the cultural differences of the single countries, there are similarities between students at all the universities. The differentiation in knowledge, in particularly concerning the computer skills and the use of modern technologies, is generally due to the dissimilar learning skills of the different universities.

NETCAMPUS believes that international networking can provide a European dimension, sharing international learning experience in education and training by cross-border delivery of courses. A sense of community for the students from

different countries working together on an ODL project emerges. Students come in contact and can work collaboratively with students from other countries and cultures ("virtual Erasmus"). It gives educators, trainers and learners with different worldviews the opportunity to exchange ideas and information and learn from each other, thus expanding each participant's global view and gaining a broader perspective on a specific subject as well as on the world in general. It helps to develop the habit of intercultural communication for learning and non-learning purposes, so raising tolerance for difference and inter-cultural awareness and broadening or breaching cultural, social, and political boundaries.

In any case intercultural differences are present in e-learning, specially in international contexts. BENVIC places great importance on the problems of cultural bias and cultural differences when making comparisons across cultures in order that each virtual campus may benefit from the benchmarking system in the way that best suits it.

4.4. Funding and commercialization

For SETTT, it is clear that institutions cannot successfully fund the development and deployment of technology-based instructional management systems and learning tools, except on a very limited basis. Institutional leadership requires that new models for development and deployment of these systems be provided, as the competitive nature of the virtual environment is such that it constitutes a serious threat to the stability and viability of traditional educational institutions.

This needs a financial plan, gathering funds from both the public and private and private sector.

4.5. Implications for LLL

Lifelong learning is a key concept linked to e-learning. Nevertheless there is more literature about the potentials of ICT and e-learning than realities. This was confirmed also by DELPHI analysis.

In general it is assumed that the integration of new technologies will enable the university to position itself in the market more successfully not only at the level of undergraduate education but also in the field of lifelong learning.

SETTT quotes: "New educational techniques, based on ICT, will enable a close link to be established and maintained between the University, its alumni, and the business world. In this sense the alumni will become a vector through which lifelong learning can be promoted, encouraging awareness of and better satisfying the established need in business and industry for continuous further education". Nevertheless, this is more an intention than a reality, since they do not provide data in this respect.

NETCAMPUS confirms the importance of the extension of the student group to the mature student in the framework of open learning, continuing education and/or lifelong learning. Nothing else.

BENVIC typology, though developed for higher education, can eventually be extended to lifelong learning and to continuing education and training after some adaptations.

5. Innovation defined; its sustainability and diffusion

5.1. What was considered innovative?

A crucial issue is to define what is an innovation. Innovation is a novel combination between means and ends. A work results as innovative when people are crating a value by implementing new ideas. In reference to the SEUSISS-project there were a large amount of innovative factors observable.

CLIENT considers that one of the innovative aspects of the project is the intercultural dimension through which students of different nationalities, and with different backgrounds regarding the problem-oriented and context-based approach, will co-operate in finding solutions to real-life problems with European companies.

The creation of a "map of competencies" for each institution willing to create a virtual campus is for BENVIC, an innovative instrument for institutions. The map allows the evaluation of virtual learning environments and, consequently, the establishment of a comparative analysis of them, this being the basis of the definition and application of the processes of improvement in organizations. A key conclusion of the BENVIC project was that the virtual campus and its associated competencies are 'evolving objects'; therefore, the competence map needed be embedded within an institutional arrangement that could capture and analyze competencies as they developed

5.2. What was the role of ICT in the innovations?

ICT is active part of the innovation progress and in a few cases ICT is the innovation. In the case of SEUSSIS, ICT is the key for future graduates to confirm in business live as every activity in modern live is or will soon be related to information and communication technology.

SEUSISS clearly shows, that the needs for successful employment in the future will change, and universities have to stay alert to the messages that come form students, employers and from wider ICT discussions, as to the sort of sills that will be of value to graduates in the near to medium term future and seek ways to develop these through their curricula. The SEUSISS project found a method to identify differences in the ICT skills and attitudes of subgroups within the student population in order to enhance and amplify the education.

In the case of CLIENT there have been two main innovative topics. First, an innovative exchange of experiences among universities of different nations by using ICT. Second, the innovative factors resulted out of the Internet customer-assistance based on ICT. According to this, the role of ICT was fundamental for the whole process of the project.

5.3. Were the innovations studied sustainable/scalable?

Again sustainability is a weak point in the analysis, since very few projects deal with that matter, There are two types of sustainability: a) the one that responds to the projects itself; b) the one that goes beyond the project an look at more general considerations about the sustainability of e-learning innovations. In both cases we find little information about.

With respect to the former, it seems that the representation of all the partner universities are in the project by departments and persons who have a strong influence upon the education innovation policy in their institutions is the best guarantee for a sustainable application of the projects' outcomes within their own universities.

With respect to the latter, the project NETCAMPUS report that the implementation of e-learning in a networked environment offers a great potential, like flexibility, joint course development, or cost sharing. But, in spite of the various efforts that have been invested in the different e- learning networks, there is still a great reluctance to embark on large-scale activities that are self- sustainable and permanently embedded in mainstream education.

Chapter 4: Indicators of Change

The analysis of the projects offers an insight on the indicators that point out to the uses of ICT in learning and on the more relevant functions and characteristics of that are present in the learning environment. In this section outlined is the contribution of the analysis done to the refining of the parameters and the definition of the indicators previously used. The indicators discussed are given in bold

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

Predominant Teacher roles
While new pedagogical strategies and ICT-supported learning are closely linked in most of the experiences, it is not clear which of the two triggers innovation in the classroom. The teacher roles identified in the projects are not all innovative or a direct consequence of, but in a way they emerge from a new understanding of the role of the teacher in promoting innovations in ICT-learning settings. Certainly the projects indicate a recognition of the change *from a teacher-centred to a learner centred approach* – a trend not wholly deriving from new technology use. However, it is clearly not the case that this trend makes redundant the traditional role of teacher; in many projects the roles of teachers and students remain unchanged.

One of the key reasons for changes in roles is that by knowing the new emergent roles we could talk about a set of competence dimensions useful to develop training programmes. It has been proposed that instruction of teachers and tutors for handling e-learning courses will be done by starter seminars at the partnering institutions, handbooks for the different roles in the course and short meta-courses on course-management. Faculty who engage in the development and delivery of courses at a distance may find that the roles to which they have become accustomed in a traditional university environment have changed in the online environment. Such a change will be accompanied by the emergence of *new job profiles* in the university. Experienced assistants working in the field of educational media and technology could be invited to give their support to academics in the process of integrating these new technologies.

The role of *teachers as collaborators* of pupils and of colleagues both face to face and from a distance was commonly practiced in all projects. Teachers' collaboration skills and dispositions are identified as crucial in many respects (teachers in participating in formal and informal networks of teachers, etc. increased collaboration and rich interpersonal relationships among the teachers minimise power-related tensions that may arise among ICT coordinators and the teaching staff, supports the decentralisation of decision-making, and has a positive impact on the effectiveness of the introduction of ICT in curriculum-based activities.

Another identified role is that of the *teacher as a co-learner*, facilitator of students' inquiry, guiding student work and offering individual help; the teacher's role in coaching, observing students, offering hints and reminders, providing feedback, scaffolding and fading, and modelling are further powerful enhancements to any learning situation. The teacher as trainer of other colleagues was also identified.

As with respect to student's roles, the projects observed or encouraged shifts stressing the importance of *active learning*. A project encouraged pupils to become *young researchers* who use new technologies to process, represent and communicate 'scientific' data collected on the basis of real-life observations and teamwork. In one of the projects students assumed several different roles: *recipients, instructors, team and individual workers* etc.

Teacher and student interaction

Most of the experiences analysed contain a similar range of services which they specify as aimed at improving interaction. These include content and communication services, interaction services (Forum, Chat –in real time, user homepages, etc) and Evaluation Services (Self-assess, examinations) together with Administration Services (Administer course, edit course with on line web editor, edit quiz etc).

But, interaction depends not merely on the technology devices used but on the users clearly "seeing" how to do it and why. Building up networked teams by the Internet, without any physical contact, has as result an innovative work basis. *Interaction need to be closely linked to a sound pedagogical approach*, and not to the use of possibilities of the Internet tools by themselves.

A general observation is that the patterns of teacher-student and student-student interactions, accompanied by a shift in the teacher/pupil roles and the use of ICT, change from conventional classroom patterns - where teachers initiate and direct classroom interaction, dominate talk and define success, to more *pupil-centered, team interaction and collaboration patterns*. In school settings, teacher-student and student-student *interactions are influenced by computer-lab or computer-classroom arrangements* and in particular how computers are arranged in the schools (traditional class, small group projects, or individual work). Pupil to pupil interactions are often based on *small group co-operation, collaboration and shared construction of meaning*. In the computer rooms, the pupils are often co-operating two and two or in a small group. They learn to listen to each other and to discuss the findings from Internet etc.

Attitudes of actors

Attitudes towards e-learning repeat the patter *technophobia-technophilia* present during decades in the educational system. Instructors often have negative perceptions of technology-supported learning and open and distance learning; they can't see the educational benefits or the potential of new ICT-based methods. They question whether the Internet can actually be used effectively for educational purposes and resist this new mode of instruction.

Observations in regular school classroom revealed that the attitudes towards ICT among teachers varied enormously from fear, scepticism and indifference to wild enthusiasm and excitement. Fear *that technology will replace teachers* appears. Tensions among schools coordinators and colleagues, are also mentioned.

In this perspective, crucial factors in developing positive attitudes among teachers are the provision of high quality training on ICT. Teachers with positive attitude towards ICT start using ICT in "ordinary" teaching outside the context of projects.

As with respect to students, one positive attitude towards ICT is the increasing importance of ICT crucial for their professional career. Positive attitudes of staff to technology help students with the emerging use of e-learning, where pedagogical as well as technical issues arise.

Female students' attitudes towards ICT varies. A project report that female students were generally less confident than males, and reported fewer skills and lower competence levels.

Teacher workload

Concerns about the workload of using ICT in education seem to be a main obstacle on all levels (pedagogical, technological and organisational). It is assumed that the *task of preparing an ICT-based course is more onerous than a traditional teaching approach*, as well as the integration of new pedagogical methods. *Feedback and guidance via Internet-services* are regarded as essential elements of computerised distance learning, it is very time-consuming and demands adequate evaluation. Institutions, as for instance universities will need to put in place a policy recognising and validating academic cooperation in the setting up and development of educational technologies.

For the *reduction* of workload readymade *expert-statements in forums* are introduced automatically when the students have written their contribution. Most important is the *use of tutors (alumni):* Teachers can handle a larger number of students than in conventional courses.

Teacher collaboration

Collaboration is a key word in e-learning. The online platforms offer teachers the *online-facility for cooperation* with respect to the e-learning course: teachers provide others with their experiences and offer new modules and ideas for enhancing the courses. This does not mean that these possibilities are taken into account in reality. In international settings, scholars who are well known in their field and to each other and who are used to common and regular exchange of ideas, experience and knowledge.

Teacher collaboration is also necessary for *creating quality materials*. Staff has the opportunity to work collaboratively and closely with colleagues that are spread around geographically disparate teams.

Assessment

Assessment in e-learning needs an special attention. There are many approaches, which reflect different assessment theories. Self-assessment is also considered. These approaches go from the *dominant positivistic paradigm* in pedagogic assessment, to a *constructivist-oriented assessment* focused on *learner-centered and learner-directed assessment.*

In most online learning experiences, types of *assessment-workflows* are sometimes integrated into the LMS, including formative and summative assessment schemes. Assignments are *submitted via Internet,* but in most of the cases the *final assessment is face-to-face based.* In other cases the knowledge is *assessed continually,* and supplemented by *limited formal assessments at group meetings.*

Affective and socio-cultural factors that influence learning processes

For some ICT functions as a system that shapes students' lives, learning styles, fashion concepts and social relations and produces a multiplicity of technologies of gender, social class or national identity. ICT is more than a system of communication and production tools, it is a culture with rules, genres and consumption patterns of its own. In this perspective, affective and socio-cultural factors related to e-learning have a profound macro-social and cultural character well beyond school culture. *ICT as a 'cultural' system* has a cross-national character and shares many common elements from country to country.

If we talk about schools, *the school culture defers from country* to country because it is deeply rooted in the differences in the learning patrimonies of European countries. *This universality of the ICT culture creates many opportunities for collaboration and sharing* which may positively affect learning processes in schools (as contrasted to the national character of school culture). Teachers working with other colleagues online can have different perceptions and understanding.

In online learning *new opportunities of collaborative work between geographically disparate teams appear*. Staff has the opportunity to work collaboratively and closely with colleagues. Students also show enthusiasm in communicating with pupils from other countries which is indicative of the *attractiveness of perceived socio-cultural differences* to them, something that can greatly enhance learning at many different areas (affective and socio-cultural, domain specific, etc). For example, pupils might exhibit interest in communicating with pupils from other countries and through teleconferencing and the bulletin board pupils had the chance to get to know each other and exchange ideas and information.

2. **Institutional/organisational changes as a result of ICT and e-learning implementation**

Main institutional changes resulted from the introduction of ICT and ODL into existing structures

Universities are undergoing fundamental changes, as sources of knowledge; they are tasked with mass education programmes in their undergraduate programmes. In addition to this, they are under considerable pressure to create vocational streams. Knowledge in itself is not enough, education must lead to employment and the mission to ensure vocational education includes the responsibility for maintaining it and for developing it within a framework of continuous learning. In such a context, information and communication technology (ICT) appears today as one of the most appropriate tools. It affords the possibility of allowing everyone to learn, when he or she wishes it, whether as part of initial or subsequent learning.

Networked and computer-based learning cause an *increase in costs for the organisation*: costs to develop and deliver online courses, the cost for the technical infrastructure (e.g. connectivity, network access, etc.). There are several *barriers related to copyright issues* which raise questions for organisations. For instance, ample time is needed to apply for permission from government entities to create new programs and market the programs successfully.

A successful reorganising process moves the use of ICT as being primarily up to the individual teacher to being a part of the responsibility of schools. E-learning is used to

establish *research partnerships as agents of change where professional researchers and researching practitioners co-operate* purposefully on formulated development targets. In research partnerships, on regional as well as trans-national level, different actors in the educational system co-operate purposefully on formulated development targets. Teachers and school administrations have immediate access to up-to-date know-how and are engaged in the development process of their specific school.

The institutional context of schools is an important factor affecting the use and implementation of ICT. *Major institutional factor is the school curriculum,* which needs to be adapted to the new possibilities offered by ICT, and to the labour market. For instance, new interdisciplinary courses might implemented as add-ons to the existing curricula. It is crucial that the courses continued to be part of the school activities after the completion of the projects.

The role of Staff training
Characteristically, teacher training is assumed to be part of the innovations. *Any strategic ICT implementation plan needs to consider teacher training.* The view that the teachers' role changes considerably with the introduction of e-learning based training courses and this change requires tailor-made teacher training in ICT in general and tailor-made teacher training courses in particular is apparent. Teacher training is recognized of utmost importance:

a) for *developing multimedia materials*: New ways of working therefore should be devised which put an emphasis on the exchange of knowledge and skills between different specialists in support of the new pedagogical project. It will almost certainly take a few years before this changed paradigm can be really put in place

b) for *integration of new methodologies*: Institutions should re-think their recruitment systems, the on-going training of both academic and administrative staff, but above all their promotion criteria

Teachers and tutors need *training on LMS*. There is no general strategy for online teaching and the uniformness of e-learning platforms suggests that a given toolset is sufficient for the implementation of any course. There are crucial issues for the successful use of online courses in teacher training which include: a) learning and working in groups; b) rich student activities; c) guidance by tutors and teachers; d) integration of face to face seminars; e) and classroom and field work examples and tasks. Online education cannot avoid the need for integration of real contact and field work from local and regional settings.

Before the introduction of projects in the classrooms, it is wise to train the teachers, either online or face-to-face, in order to serve as a reference guide for the implementation phase.

Universities should re-think their recruitment systems, the on-going training of both academic and administrative staff, and consequently, their promotion criteria.

Main actors, adopters and resisters to the adoption of the innovation as identified in the project
Managers, teachers, students and researchers are the key actors in innovations.

Active participation by the students is a clear indication that students in principle tend to become adopters of such innovations. Examples of *teaching each other* and their teachers how to work on the Web and often *working on the projects* on their spare time, are signals of adoption of ICT innovations. Students show also resistances specially when they lack computer literacy and technical skills on using the online environments.

Teachers range from potential adopters to potential resisters to innovations. *Resistance of actors* appears for many reasons: many instructors do not like to learn how to use a new electronic learning environment; they are sceptical about the potentials of ICT for teaching. Lack of technical background, lack of basic computer literacy of the instructors, and lack of technical support are obstacles in introducing ICT in education. The new roles of teachers (from transmission of knowledge to teach how to learn) cause also resistances. Changing what they think as appropriate pedagogy for the learners themselves and their subject area may be difficult. This can be even harder when teachers act in isolation from one another and are not exposed to innovative models of learning.

Many experiences mention that resistance arise when these are not part of the regular courses. This is part of any innovative implementation.

Other *pressure groups* identified as playing a potentially important role in the adoption or rejection of an innovation in schools are *parents, school administrators, pedagogues, enterprises and political authorities*. In the school sector, parents tend to exert minimal pressure to schools. How their demands are taken into consideration depends on local conditions and how good a relationship parents have with teachers in the school. Pressure from administration and political authorities over schools to integrate ICT into school teaching appears to be universal, systematic, and strong but there is not clear indication if this pressure includes e-learning related innovations.

Non-economic lobbies do not always share positions. Some are against the computerisation of schools and the tendency for commercialising education that they believe goes along with it. Conversely, enterprises can be active promoters of ICT adoption in schools and innovations related to their interests.

It will be necessary therefore to define what some people call a *new educational contract* between the different partners establishing the rights and responsibilities of each one.

Organisational conditions that are (un)supportive to innovation
A major organisational issue at school level are the arrangements regarding the *placement of ICTs in schools*: computer labs versus computers in the classroom. Apparently, the latter solution allow for more profitable educational activities than those held in the computer lab, where there are schedule-planning constraints.

An *ICT development plan* clearly enhances the capacity of schools to integrate ICT and absorb ICT-related innovations. A detailed technology plan considering funding, installation and integration of equipment, ongoing management of the technology etc. should express a clear vision of the goals of the technology integration.

Furthermore, an *organisational culture* that is characterised by *teacher collegiality and formal or informal collaborative work*, both supports and facilitates the development of the organisation's members.

Flexible time-tables, flexible allocation of staff tasks and roles, supportive administration and incentives, are also organisational conditions that support ICT-based innovations

In the case of higher education institutions, key aspects to taking into account in order to implement successfully e-learning and/or virtual campuses:

- *Access to local facilities*. In a distributed environment it is a challenge for the university to making library resources available for distant learners and giving access to e-libraries is an important issue.

- *Timing*: Co-ordination and planning problems may emerge because of learners and teachers working in different time zones.

- *Registration*: Institutions offering programmes across countries should take care of some administrative problems.

- *Payment:* Registering for a course usually implies payment.

- *Security*: When all contact and communication between universities, teachers, and students is happening through the web, security becomes an important issue.

- *Infrastructure/access*: students can be frustrated by the computer and network facilities available to them or by features in the electronic tools they are being asked to use.

- *Financial aspects*: Networked and computer-based learning cause an increase in costs for the organisation--costs to develop and deliver online courses, and the cost for the technical infrastructure.

- *Accreditation/credit transfer*: courses attended at another university or offered by a consortium on line may not be accredited in the student's home university.

- *Copyright – intellectual property*: The creative effort of the academic staff should be protected from copying, use and sale elsewhere, keeping the different national legislations in mind.

- *Competition*: Universities face a significant and growing competition from other and new types of e-learning providers.

- *Networking*: Gives opportunities to universities to collaborate not only on the design and development of courses but also on the delivery of courses, and on Internet or web based education materials and curricula.

When *evaluating and implementing virtual campuses, the elaboration of a "map of competencies"* that identify and analyse all the competencies required by an institution in order to define, implement, manage, and evaluate a virtual campus from the educational, technological, organisational and economic standpoints. It has been proposed three types of indicators: *structural, practice and performance indicators*. The aim was to develop a set of meta-indicators to mirror all particularities of virtual learning organisations that need to be characterised. These are: a) Learner Services; b)

Learning Delivery; c) Learning Development; d) Teaching Capability; e) Evaluation; f) Accessibility; g) Technical Capability; h) Institutional Capability

Within the *adult education* and school sector implementing and servicing electronic learning management systems is extremely difficult and often cannot be sustained within existing organisations. A very important point has emerged that is related to the need for experimentation and testing and which does have organisational implications. Current e-learning systems and platforms show a wide variety of systems based on different paradigms and emerging standards: most systems have a very specific focus and feature set. The ideal situation would be to develop the whole content and the course structure, devise all tasks for individual students and groups with the appropriate evaluation procedure and then survey and select existing systems and choose the appropriate platform.

The outsourcing of the tasks required is often necessary including the development of content. Higher education structures, whilst maintaining rigidities, however do have large joint information infrastructures which often operate nationally and internationally and have done so for considerable periods of time. In view of the difficulties noted particularly within the adult education projects there seems to be good reason for investigating how large scale information infrastructures could be developed at regional, national and international levels.

On the other hand, "quick and dirty products" – tailor-made interactive assignments - are gaining more and more importance as they rather correspond with the teachers' needs and approach rather than highly professional and complex multimedia material, designed for the leisure-time market and not for courses aiming at a qualification level. Copyright issues still seem to be unsolved for teachers and the insecurity in legal terms makes them withhold material they have developed.

Cost effectiveness
Cost effectiveness in e-learning can be achieved through joint working and sharing of infrastructure and by entering into contractual arrangements with commercial and other entities. *Within the university and higher technical sector clear analytical frameworks for cost analysis exist* and this is particularly so with the further development of the joint information infrastructures that most European universities operate collaboratively. This area is extremely opaque for other sectors.

For some, *online learning can be at least as cost-effective as face-to-face teaching*. Moreover, the development of virtual delivery models will most likely result in a higher degree of cost-effectiveness and a cost reduction. Costs can be reduced through standardisation, resource sharing, economies of scale, increased productivity, and by purchasing hardware and software jointly. Additionally, travel costs can be lowered.

Networking of institutions can help in overcoming the problem of professional marketing and sales of their e-learning educational and training services, which is precondition of reaching the "critical number" of learners, sufficient to cover the cost of development and delivery of quality courses. It may enlarge the 'customer base' of a university and facilitate international promotion as well as acquisition of relevant competencies and know-how from partner universities. Functions such as the development and distribution of learning materials, tuition, assessment, online

registration and record-keeping, award-granting, learner support, and general administration can now be shared through a wide variety of organisational arrangements marked by specialisation and "added-value" partnerships involving both the public and private sectors.

One of the key elements put forward for not investing in new educational approaches concerns the costs. That's why *an accurate analysis of costs is necessary*. The proposed <u>direct costs</u> to analyse in online learning would be:

- Cost of materials (servers, PCs, peripherals etc)
- Cost of software Costs of network infrastructure
- Costs of communications Cost of maintenance and updating
- Staffing costs (technical staff managing infrastructure and cost of those responsible for the development of projects)
- Cost of tutoring
- Cost of technical assistance
- Staff training costs
- Costs of consumables (cables, diskettes etc)

Other *indirect costs* to be taken into account are time spent by academics learning the educational technologies.

Flexibility

Flexibility is a key concept in e-learning. For many flexibility is understood in many ways:

- Flexi*bility of the tools selected:* Institutions will customize Web portals to suit them and furthermore, it will be very quickly alterable to suit differing sets of circumstances.
- *Students access:* to improve quality of service to their existing students and increase flexibility of access in order to build new markets for their course offerings.
- *Curriculum*: One major challenge which teaching institutions will face during the coming decade, most especially in higher education, will be the transition from traditional institutions with fixed courses and relatively stable programmes towards organisations where flexibility will be the central element.
- *University structure:* In the development of new operational model, it has striven to cater to a much wider range of students, and also to implement a much more flexible access provision for these students.
- *Course management:* Online teaching increases the teachers' flexibility with regard to time and place. Teachers appreciate this, but on the other hand they realize that online workload is higher.

Accessibility

Access, and more specifically online access is understood also in many different ways:

- Access to online learning services

- Access to a vast amount of knowledge, instead than access trough the teachers

- Access of tools as freely available software

- Access to training products and materials

- Access to information to everybody

Distributed learning can meet the needs of people at a disadvantage (geographical reasons, un-regular working hours, social reasons, special needs, etc).

3.   Other socio-Economic aspects of the innovations

E-learning standards

Content and technical standards need to be adopted that will optimise interoperability with other institutions in areas such as the creation of learning databases, information databases such as libraries, administrative systems and learner support strategies as well as the facilitation of interactions among learners and teachers. Building an *educational repository that provides access to learning objects* requires standards and structures that can facilitate object storage, retrieval and aggregation to suit the needs off learners or the pedagogical intentions of instructional developers.

There has been a move to produce standards for Instructional Management Systems. This initiative, the IMS Project (www.imsproject.org) has led to a comprehensive set of guidelines, which relate to the interoperability of computer systems in the educational field. Several standards currently exist in open distance education: AICC, SCORM and IMS for example. They are intended to ensure *systems' portability*. The lack of definitive LMS standards and evaluation criteria in educational software and electronic learning management systems is still noticeable and makes decision-making very difficult.

Globalisation

The e-education market, particularly in higher education, has grown considerably in the last years. With globalisation, one questions whether the very survival of institutions is under threat. Globalisation generates a requirement for stronger local strategies and policies. Increasingly, knowledge and information are the driving forces behind the new social structures. Consequently, the objectives of education and training systems will need to be shaped to cope with the rate of change.

Universities face a significant and growing competition from other and new types of e-learning providers. They are undergoing fundamental changes as sources of knowledge; they are tasked with mass education programmes in their undergraduate programmes. In the higher education market traditional universities not only have to compete more and more with other universities but also with virtual and commercial organizations and companies, all offering the same type of courses.

Other socio-cultural factors influencing learning processes

Intercultural differences are evident in e-learning, specially in international contexts. The main socio-cultural influences between the different countries with respect to the use of ICT come from different aspects: *varying cultural and language background,*

ICT skills and attitudes, varying between universities (so countries), *demography*, *age and gender*. Nevertheless, despite the cultural differences of the single countries, there are similarities between students at all the institutions, specially universities.

Intercultural awareness can be developed through distributed collaboration as information and experience are exchanged about local environments, structures of institutions and civic and cultural protocols. Multilingual presentations is not a problem at one level. It is the enormous resources required to transform and translate content into a range of languages. It is however unclear that where partner institutions operate within a limited international range and where there is little previous experience of different cultures how within projects such as these there is enough time for analysis of, reflection on and experience of differing cultural biases.

It is recognised that *networking can provide a European dimension*, sharing international learning experience in education and training by cross-border delivery of courses. A *sense of community for the students* from different countries working together on e-learning projects usually emerges. It gives educators, trainers and learners with different worldviews the opportunity to exchange ideas and information and learn from each other, thus expanding each participant's global view and gaining a broader perspective on a specific subject as well as on the world in general. It helps to develop the habit of *intercultural communication for learning and non-learning purposes*, so raising tolerance for difference and inter-cultural awareness and broadening or breaching cultural, social, and political boundaries.

Funding & commercialisation

Generally speaking, institutions cannot successfully fund the development and deployment of technology-based instructional management systems and learning tools, except on a very limited basis. Institutional leadership requires that new models for development and deployment of these systems be provided, as the competitive nature of the virtual environment is such that it constitutes a serious threat to the stability and viability of traditional educational institutions.

In other sectors the situation is not much different. Many students in upper-secondary adult education usually do not have the financial means for top-level IT-equipment and fast internet-connections. Implementing and servicing electronic learning managements systems (LMS) has proved a task far too ambitious for an average sized school: Running a server with a LMS has to be outsourced and serviced by experts to guarantee a reliable and working system, including a hotline and support for teachers and students alike.

The need for a *financial plan*, gathering funds from both the public and private and private sector looks convenient

Implications for LLL

Lifelong learning is a key concept linked to e-learning. Nevertheless there is more literature about the potentials of ICT and e-learning than realities. For instance, it is said that e-learning will enable *a close link to be established and maintained between the University, its alumni, and the business world*. In this sense the alumni will become a vector through which lifelong learning can be promoted, but this is a promise just now.

In general it is assumed that the integration of new technologies will enable the university to position itself in the market more successfully not only at the level of undergraduate education but also in the field of lifelong learning. It is more and more important the *extension of the student group to the mature student* in the framework of open learning, continuing education and/or lifelong learning.

Conclusions

The process followed in the review of the set of 18 MINERVA-supported projects and the review/meta analysis conducted in terms of the perceived changing paradagms in teaching/learning –due to the presence of technology in the sphere of education, revealed a set of indicators that require the attention of the education planners and education actors in general.

The results outlined in the previous section suggest that the new forms of educational provisions –whether viewed from a reciepient or provider perspective, require a rethinking of what teaching and learning is. In such a process the indicators identified, discussed in the previous section, play a benchmark role in the conceptualization, structuring and operationalization of that which today we tend to call e-learning. The results of this analysis indicate that fundamental changes emerge in the transfer of knowledge at all levels whether school-basaed, higher education or adult learning. The transversal nature of the indicators of change –whether these address the issue of roles or organizational conditions, invite the policy maker to, upon a reflection of what was to what is and what will it be, articulate policy(ies) that is/are to be supportive of that which is to maximize the effective transfer of knowledge to the wider possible sector of our population.

While at the initial stage DELPHI treated the review process of MINERVA projects from a three dimensional perspective, the review revealed that the dimensions examined –pedagogy, institutional / organizational change and socio-economic aspects, hold strong interdependencies suggesting that policy formulation (and thereafter innovation implementation) can not be fragmented from a dimensional point of view but rather to treat the new forms of education from a holistic perspective at all levels of education.

The review process revealed valuable information as to the "ingredients" of new form of teaching/learning and suggests that there is a multiplicity of issues that have not been addressed nor reflected upon (always referring to the set of projects that constituted the primary source of information in the project). The DELPHI Consortium recognizes that the review process might have omitted parameters and issues dealt with in the case projects that could have revealed valuable information regarding the rethinking of teaching/learning in the digital age and is apologetic to the projects if that is the case. In parallel the Project is grateful to the 18 projects for sharing the knowledge produced in the frame of their implementation.

Areas for Policy Considerations

1.   Teacher Training
As the role of the teacher in ICT based educational settings is different from that of the conventional settings consideration needs to be given to the "appropriate" training of teachers. This has strong implications on Teacher Training Institutions as their curricula need adjustments so as to be supportive of the complementary role of the teacher to the existence of technology in the school/learning institution.

2. Infrastructure Arrangements

As it has been observed the arrangement of computers influences the interaction process (teacher-learner, learner-teacher). This finding suggests that the educational planner –whether school administrator or State official, defines first the desired interaction model and accordingly arrange the available infrastructure.

3. Harmonization of Actor's attitudes

It appears that the sustainability of an introduced innovation in learning (ICT based) is dependent on the attitude of a variety of educational actors. The current state of affairs where instructors/teachers stand at either side of the spectrum –technophobia or technophilia, creates tensions that can be avoided with "better" planning that is to involve all of the educational actors. Notions such as knowledge sharing, knowledge production and continuous discourse between the actors deems necessary. Incentives appear to be needed for all actors to operate under the same wavelength.

4. Assessment

Assessment of learning outcomes appears to have received a rather low priority in the list of the educational technology supporters. Parameters such as the development of collaborative skills, recognition and acceptance of the "different" need to be considered besides the prescribed learning outcomes.

5. Restructuring of the traditional institution

This is stronger for the higher educational sector – a sector that has received attention, but little has been done for the school sector. An island of innovation does not facilitate the creation of an ICT based culture. All school actors need to be helped (perhaps via initiatives) to establish a dialogue amongst themselves (or be guided towards it) where considered are the roles these play (with emphasis on the power shift that comes from different role playing).

6. Organizational Planning

The undertaking of innovation in learning whether ICT based or e-learning appears to be in need of organizational planning. Such planning can start from an ICT/e-learning development plan which ought to encompass aspects of collaboration of actors, time schedules, arrangements for participation, financial issues, accreditation, security et al. Particular attention should be given to cost effectiveness of the initiative and indications of its sustainability and scalability.

7. Socio-cultural Issues

Although the promotion of ICT in education and its spin-off notion of e-learning is done in the name of providing equal opportunities to all, as technology from a technical perspective is capable of giving equal access to all, the cluster of projects reviewed do not provide strong evidence to this effect.

It appears that the socio-economic parameters of and for ICT based/e-learning have not adequately been researched so as to provide an evidence base of its role in the structuring of our learning systems. (This might be a deficiency in the methodology of this project.) This is perhaps the area that the policy makers ought to consider the most in the formulation of a research policy regarding e-learning.

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