IBD

Social Inclusion by Proactive Design

InclusiveByDesign

Final report of activities

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Executive Summary

InclusiveByDesign has been based on the hypothesis that proactive approaches in the design and development of Information Society Technology contribute to the promotion of social inclusion in education, vocational education and training (VET) and employment.

The overall aims of the *InclusiveByDesign* project have been

- to identify successful examples of proactive measures towards social inclusion in the European context, examples deriving from the market and the policy framework, and
- to proceed to concrete recommendations as regards policies and initiatives to stimulate, promote and support such measures towards mainstreaming employment, vocational training and employment.

Two phases were planned in project activities in order to reach the goals set. In its first phase the project aimed at gathering data about existing European companies / organisations in the areas of education, vocational training and employment, regarding the possibility of practicing inclusive design. Another goal of the first phase was to gather information about existing policies at European, national, or regional level that could possibly contribute to the support of inclusive design practices by companies / organisations.

Data collection for the first question was done through the creation of a survey in the form of an online questionnaire, investigating the possibility of inclusive design technology and management practices. This online questionnaire was sent to a wide range of companies and organisations.

To investigate the second question a policy survey was carried out, searching through existing literature sources regarding policy at European, national, or regional level, and gathering material relevant to policies supportive of inclusive design practices.

In its second phase the project aimed at verifying the online questionnaire results and also at collecting in-depth information regarding processes, outcomes and contexts of inclusive design. The end-target of this phase was to produce input for final recommendations on how to support inclusive design practices, within the above specified domains.

The goals of the second phase were pursued by developing case selection criteria for best practice, relevant to product / service inclusiveness and by applying them to the results of the online questionnaire for selecting the project's target cases. Business, technology and policy issues raised in the first questionnaire were transformed into hypotheses to be supported (or not) through data collection from the selected best practice cases of inclusive design. In terms of case study content, the data collected from the selected best practice cases was based on structured interviews, created from the business (ITA), technology (FORTH-ICS) and policy (CNR-IFAC, VFA) perspectives respectively.

The project's results point to several aspects characterising the current state of affairs regarding industries' conception of inclusive design. Specifically, inclusive design remains a fuzzy concept with broad connotations. Industry seems to appreciate the potential of its benefits in the medium to long term, but in the short term it seems hesitant to invest on inclusive design as a drive for innovation. This is attributed to several reasons (exhaustively discussed in the report), including the lack of an articulated demand for inclusive design on behalf of citizens and their organisations, the lack of suitable policies to formulate a framework for inclusive design, but also lack of knowledge (both know why and know how) on inclusive design. On a positive side, industry appears to be interested in serving different user groups, but it seems to rely solely on mainstream technology to cope with user diversity.

It appears, therefore, that an effort should be made:

- To support research activities in all aspects that could enhance and simplify the development of inclusive products (e.g., validation exercises for inclusive design guidelines, criteria for benchmarking, tools which ease the design and development of inclusive products, etc)
- To support industry in developing examples of products based on innovative technology in order to show advantages of the inclusive design approach – for instance, through contests or awards announced by international design centres or expositions
- To disseminate business, technical and policy-related knowledge about the field by means of standards, industry information days and workshops, networking, etc.

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1 Introduction

The project Social Inclusion by Proactive Design (*InclusiveByDesign*) concerns the potential of new forms of social exclusion, which may emerge in the course of the move towards the knowledge economy and society. Three domains where products and services create a strong potential for impact on social inclusion (or on the prevention of social exclusion) are those of education, vocational training and employment. *InclusiveByDesign* is based upon the hypothesis that proactive approaches in the design and development of technology (e.g., as promoted by the principles of 'design for all') will contribute to combating social exclusion in employment, vocational training, and education, while meeting prevailing economic constraints and needs (e.g., economic efficiency). Consequently, the project has aimed to identify best practice examples of proactive business and technology practices towards inclusion, so as to generate recommendations on realistic frameworks of policy measures and initiatives that stimulate, facilitate or support proactive measures towards mainstreaming employment, vocational training and education.

InclusiveByDesign has been based on the hypothesis that proactive approaches in the design and development of Information Society Technology contribute to the promotion of social inclusion in education, vocational education and training (VET) and employment.

The project has been carried out under the responsibility of the Foundation for Research and Technology - Hellas, Institute of Computer Science (FORTH-ICS) in co-operation with

- the Consiglio Nazionale delle Ricerche – Institute of Applied Physics "Nello Carrara" (CNR – IFAC),
- the Research Institute of Technology and Work (ITA) at the University of Kaiserslautern, Germany, and
- Valter Fissamber and Associates Ltd - VFA.

1.1 Objectives

The overall aims of the *InclusiveByDesign* project have been

a) to identify successful examples of proactive measures towards social inclusion in the European context, examples deriving from the market and the policy framework, and

b) to proceed to concrete recommendations as regards policies and initiatives to stimulate, promote and support such measures towards mainstreaming employment, vocational training and employment.

Two phases were planned in project activities in order to reach the goals set, the objectives of which are the following:

1.1.1 *InclusiveByDesign* - Phase I objectives

In its first phase the project aimed at:

a) Gathering data about existing European companies / organisations in the areas of education, vocational training and employment, regarding the possibility of practicing inclusive design. This was done through the creation of a survey in the form of an online questionnaire, investigating the possibility of inclusive design technology and management practices. This online questionnaire was sent to a wide range of companies and organisations.

b) Gathering information about existing policies at European, national, or regional level that could possibly contribute to the support of inclusive design practices by companies / organisations. Along those lines a policy survey was done, in order to search through existing

literature sources regarding policy at European, national, or regional level, for gathering material relevant to policies supportive of inclusive design practices.

1.1.2 *InclusiveByDesign* - Phase II objectives

In its second phase the project aimed at verifying the online questionnaire results and also at collecting in-depth information regarding processes, outcomes and contexts of inclusive design. The end-target of this phase was to produce input for final recommendations on how to support inclusive design practices, within the above specified domains.

The above goals were pursued by developing case selection criteria for best practice, relevant to product / service inclusiveness and by applying them to the results of the online questionnaire for selecting the project's target cases. Business, technology and policy issues raised in the first questionnaire were transformed into hypotheses to be supported (or not) through data collection from the selected best practice cases of inclusive design. In terms of case study content, the data collected from the selected best practice cases was based on structured interviews, created from the business (ITA), technology (FORTH-ICS) and policy (CNR-IFAC, VFA) perspectives respectively.

InclusiveByDesign project has produced the expected deliverables. As regards its duration, the initially foreseen duration of 18 months (Dec. 2000 - May 2002) has been extended to 21 months. The project has been divided in two periods. Chapter 3 of the present final report covers in summary the results of Phase I (the full description is contained in the *InclusiveByDesign* Interim Report, available online at http://ibd.ics.forth.gr/files/interim-report.pdf), while the current report covers mainly the activities that have taken place within the second project period (September 2001- August 2002).

The activities undertaken in the second project phase are as follows:

- The period between August 2001 and December 2001 was mainly devoted to the preparation of the Interim Report and the Project Progress and Evaluation Report. The virtual partners' meeting was extremely helpful at that stage.
- The **survey** results were analysed and documented. Chapter 3 of the present Report is devoted to the presentation of the survey results.
- Following the survey, a set of five indicative **case studies** was performed to illuminate aspects of successful examples. The cases were selected on the basis of criteria set out by the project team. The case studies required thorough preparation: establishment of main hypotheses; structuring of three different questionnaires, reflecting the business, technology and policy perspectives; trial test of questionnaires; establishment of contact protocols with companies interviewed; drafting of case reports and further data collection; Compilation and processing of interview data and other case study information; drafting of preliminary conclusions; feedback from companies interviewed; finalization of case reports. Chapter 4 gives a full account of the process, while Chapter 5 includes the results and the recommendations that derive from the analysis of results.
- As regards the project **evaluation**, the results of which are the subject of Chapter 6, it has continuously taken place throughout the duration of the project with two major objectives: a) to serve as a tool for 'continuous improvement' and b) to provide documented evaluatory views on two core themes: effectiveness and efficiency. Effectiveness has been judged against 3 criteria (coverage of the foci, coverage of the target areas, selection of the best examples for the case studies). The issue of efficiency was dealt with on the basis of resources utilized, quality of outcomes,

appropriateness of monitoring mechanism, usage of electronic communication means, and the dissemination potential of the project's web site.

- On May 10-11, 2002 the last **partners' meeting** took place in Kaiserslautern, Germany hosted by ITA. In the context of this meeting, the main emphasis was on issues related to the case reports and the programming of the remaining project tasks.
- A 3-month extension period was requested in May 2002 and granted in June 2002. The case studies required more effort and, mainly, time than it had been originally foreseen.

1.2 Methods used and main results

InclusiveByDesign engaged in three main research lines to assess current inclusive design practices, using interviews. The first line of work aimed to investigate the business-oriented aspects, which drive the inclusive design efforts in the five selected study cases. The second line focused on prevalent technology practices, including process-oriented design and development methods, in relation to specific techniques known or likely to facilitate inclusive design. Finally, the third line (policy perspective) engaged in an effort to investigate the extent to which the general or specific policies such as European / national regulations, legislation and/or standards exercised an influence on the lines of development in the five case studies. In the following sections, we provide a brief summary of the specific objectives for each of the above lines of activity and review the main results of the project.

1.2.1 Objectives and results of the business approach

Case study data collected from the business perspective aimed at analysing organisational aspects of approaches towards usable and inclusive products and services. This analysis covered (1) the products' and services' user population and market position, (2) assessment and benchmarking methods regarding user satisfaction, usability and accessibility, (3) involvement of end-users during design, and (4) the necessary organisational framework.

Across the five participating organisations, the target user groups of the products / services reveal a large diversity with regard to age, socio-economic status, attitudes towards computer usage, computer skills, and sensory, motor, and psychological capabilities. All organisations invest a variety of efforts towards the goal of achieving usable, inclusive products and services which can be structured according to well-known process models. The challenges which have been experienced by the case study participants in the context of their efforts can be summarized as a lack of existing effective and efficient methodologies towards usability and accessibility.

From analysing the business perspective, it can be highly recommended that European, national and regional funding institutions should lay an emphasis on supporting the development of such methodological approaches and the establishment of transnational networks. These efforts should be supplemented by customer organisations that actively request participatory usability and accessibility approaches.

1.2.2 Objectives and results of the technology approach

Case study data collected from the perspective of technology aimed, at first level, at the creation of a pool of technological approaches towards user-centred design as well as design for all. At a second level this data was processed and categorised, so as to gain insight into the maturity of the technology substrate for inclusive product design.

More specifically, the technology perspective of the case studies focused on the analysis of product diversity, regarding:

a) appropriateness and usability of the product, regarding a variety of user groups; as well as

b) proactive design of product to meet requirements of a variety of technology platforms, and contexts of use.

Analysis of the technology interview data points to several interesting conclusions, regarding industry's prevalent conceptions of inclusive design, as well as the level of resource concentration to this cause. Specifically, it turns out that there are different connotations for inclusive design, clearly influenced by industry's focus on accessibility. There have been findings pointing out to a wide range of relevant conceptualisations, from inclusive design being considered virtually the same as user-centred design, to statements that inclusive design is investment on a product's quality. At the level of tools and technology used, the data indicates reliance on mainstream tools, apparently not noting a need for specialized tools, other than information on inclusive design (know-how). This can be explained by the fact that those who practice inclusive design do not see accessibility as a pre-requisite. Finally, regarding design strategies and techniques, adaptation of presentation styles and educational content, as well as flexible structuring of the interactive (learning) experience, seem to be the prime design approaches for coping with diversity requirements.

Main recommendations from the technology perspective refer to upgrading the importance of accessibility in ICT product design, as well as to building specific points and practices early into the design process that facilitate the assessment of product accessibility.

1.2.3 Objectives and results of the policy approach

This line of research aimed to identify, and then analyse, examples of policy measures in education, vocational training and employment, which have promoted the efforts in the direction of inclusive design in each of the five case studies. In this phase, results of the phase I survey were used to guide the investigation. Our main conclusion regarding the policy perspective is that a combination of legislation in the area of inclusive design issued at all three levels (European/National/ Regional) would create a new trend and would affect many companies' / organizations' strategies in the direction of developing products and services that are inclusive. In particular, the European Commission's Recommendations and Directives often drive national and regional policies and measures. So far, European programmes / Action plans like *e-Europe* have had a very strong impact at national level policies. Nevertheless, accommodating and translating European-wide initiatives and directives into national-level legislative clauses on inclusion remains a critical target.

To this effect, the report provides a series of recommendations, which relate to three distinct levels, namely the entire IST-industry, the specific sectors of the IST industry investigated in the present study, as well as recommendations in the direction of articulating a demand for inclusive design products and services. Our recommendations, foster tight networking mechanisms, user involvement through representative organisations, legislation and standards, as well as the provision of incentives to industry, so that it becomes competent to identify new opportunities, internalise new technologies and finally appropriate the benefits of inclusive design.

1.3 Consolidated conclusions of the project

Having briefly described the lines of research undertaken by the *InclusiveByDesign* project, the methods used and the results/recommendations compiled, this section attempts to provide a consolidated statement on the current situation in the market by generalising from the data made available. This effort will neither seek to be exhaustive nor claim that results stem from

a comprehensive sample of reference case studies. Instead, given the data available, an attempt will be made to discuss some issues considered important for inclusive design.

The project's experience points to several facts, which characterise the current state of affairs regarding industries' conception of inclusive design. Specifically, inclusive design remains a fuzzy concept with broad connotations. Industry seems to appreciate the potential of its benefits in the medium to long term, but in the short term it seems hesitant to invest on inclusive design as a drive for innovation. This is attributed to several reasons (exhaustively discussed in the report), including the lack of an articulated demand for inclusive design on behalf of citizens and their organisations, the lack of suitable policies to formulate a framework for inclusive design, but also lack of knowledge (both know why and know how) on inclusive design. On a positive side, industry appears to be interested in serving different user groups, but it seems to rely solely on mainstream technology to cope with user diversity.

It appears, therefore, that an effort should be made:

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- To disseminate business, technical and policy-related knowledge about the field by means of standards, industry information days and workshops, networking, etc.

1.4 Structure of the report

The reader of this report will find a summary of project activities in Chapter 2; a brief account of the research activities of Phase I, namely the results of the initial Technology and Policy surveys are contained in Chapter 3 (for a full account of those project activities, please see the *InclusiveByDesign* Interim Report, publicly available online at http://ibd.ics.forth.gr/files/interim-report.pdf). Chapter 4 presents the process followed by the consortium for selecting the companies / organisations for the best practice case studies of project Phase II. The results of those case studies can be found in Chapter 5, along with the conclusions and recommendations resulting from the three perspectives of the study, those of business, technology and policy. Finally, Chapter 6 contains the results of the internal project evaluation.

There are also three Annexes to this Report: Annex A contains the Product / Service Questionnaire used in Phase I; Annex B contains the case Study Interview Guidelines (used in Phase II) for the perspectives of business, technology and policy; Annex C contains the data compilation in detail for each of the case studies (Case Descriptions from Phase II).

2 Project activities within the project implementation period

1st semester (January 2001 – June 2001)

Events:

- The *InclusiveByDesign* kick-off meeting took place on February 12, 2001 in Heraklion, Crete, Greece (host: FORTH-ICS).
- The *InclusiveByDesign* project website (http://ibd.ics.forth.gr) was launched in February 2001. The website is maintained by FORTH-ICS.
- The 2nd project meeting took place on June 29-30, 2001 in Florence, Italy (host: CNR-IROE)

Activities:

- Essential concepts for the project discussed among the partners for establishment of consensus (i.e., indicators of social exclusion, definitions of inclusive design)
- Preparation of drafts for the online questionnaire and draft revisions
- Pre-test of final draft
- Questionnaire sent out via e-mail. Reminders sent to prospective respondents
- Coding scheme prepared for responses
- Overview of preliminary data and decisions regarding the analysis plan
- Identification of selection criteria for best practice cases

2nd semester (July 2001 – December 2001)

Events:

- A first draft of the Interim Report was prepared by August 2001, and a final draft was delivered by November 2001.
- A Virtual Meeting was conducted among *InclusiveByDesign* partners in October 2001.
- The Project Progress and Evaluation Report was prepared by ITA in December 2001 and submitted to the EU in February 2002.

Activities:

- Survey results analysed and documented in detail
- Selection of best practice cases and further collection of relevant material
- Internal project evaluation
- Interim Report reviewed by partners

3rd semester (January 2002 –May 2002)

Events:

- Ongoing virtual collaboration took place between partners
- 3rd (last) project meeting on May 10-11, 2002 in Kaiserslautern, Germany (host: ITA).
- 3-month project extension requested in May 2002 (granted June 2002).

Activities:

- Preparation of case study hypotheses
- Structuring of interviews, construction of questions and revisions, regarding case interview protocols for the three perspectives (business, technology, policy)
- Interview trial runs
- Preparation of contact documents for participant companies
- Company interview appointments arranged
- Case study interviews conducted (data collected)

Project Extension period (June 1st – August 31st 2002)

Events:

- 3-month project extension granted in June 2002, in order to further process the data collected and prepare the final report.
- Ongoing virtual collaboration among partners

Activities:

- Compilation and processing of interview data and other case study information
- Preliminary conclusions
- Case reports disseminated to companies for feedback
- Integration of analyses and recommendations
- Preparation of *InclusiveByDesign* Final Project report and Recommendations

Table 1 summarises the timeline for *InclusiveByDesign* project activities.

Table 1:Events and activities

Year	*Month*	*Event*	*Activity*
2001	February	Kick-off meeting 12/02, Heraklion, Crete, Greece Launch of project website	Indicators & Definitions
	March		Questionnaires; Pre-test
	April		Send out; Reminders; Coding
	May		
	June	2nd project meeting, 29-30/06, Florence IT	Survey preliminary data and analysis plan; identification of selection criteria for best practice cases
	July		
	August	Interim report - draft	Survey results and case selection
	September		
	October	Virtual Meeting	Internal project evaluation
	November	Interim Report – final draft	
	December	Project Progress and Evaluation Report (ITA)	
2002	January	Virtual Collaboration between partners	Preparation of case interviews for the business, technology and policy perspectives: case hypotheses, construction of questions, interview trial runs
	February	Company interview appointments arranged	
	March	(cont'd) Virtual Collaboration between partners	
	April		Case study interviews conducted by partners
	May	Last project meeting, Kaiserslautern DE, May 10-11	(cont'd) Case study interviews conducted by partners
	June	3-month project extension obtained for analysis of results and writing of final report	Compilation / processing of interview data
	July	Case reports disseminated to companies for feedback	Preliminary conclusions
	August	Conclusions exchanged between partners in virtual collaboration	Integration of analyses and recommendations / Report finalisation

3 Phase 1: Survey

The exploratory survey completed in Phase 1 of the project was comprised of two parts, the Technology and Service survey and the Policy survey. The different methodologies needed for collecting the necessary information were the reason for not incorporating all topics into one survey.

3.1 The technology and service survey

3.1.1 Objective

The objective of the survey was to get an overview on prevailing engineering approaches and methods, as well as on suitable business processes, for designing and developing "inclusive" products / services for the domains of education, vocational training, and employment in Europe. The survey was designed to collect some key data from the main European actors. In the follow-up phase, case studies were performed with a small number of participants to get in-depth data for a collection of good-practice examples. The final goal was (in combination with the case studies of project phase 2) to identify successful examples of technology, in terms of product and service design, that facilitate inclusion or prevent exclusion from the domains of education, vocational training and employment.

In the context of this phase 1 survey, *Inclusive Design* was defined as a quality attribute of technologies (i.e., products or services), which characterizes the extent to which they are designed to be usable and accessible by diverse groups of citizens. Some examples of people who might have fewer opportunities for access to technological developments are those who do not get secondary or higher education, those who live away from technologically advanced areas, those who are homebound by illness or other reasons, or people with disabilities. The concept of Inclusive Design was introduced and used to avoid terms like “Design for All”, “Universal Design” or “Universal Access”, which have different interpretations and connotations and could distort survey responses. However, it is clear that the concept of Inclusive Design might be equally biased, such that the participants’ perceptions and individual definitions of it needed to be addressed and analysed in the case study phase.

3.1.2 Address pool

The address pool of potential respondents included European companies offering products / services in the domains of education, vocational training and employment. The addresses were collected via Internet-based research. In the fields of *education and training*, exhibitions, fairs, research programmes, and various thematic Web sites or mailing lists were the main sources. Regarding *employment*, the emphasis was on job / recruitment sites. However, this field cannot be seen isolated from education and training, since the latter usually constitute a precondition for employment.

In total, the pool comprised 376 addresses, inter alia: 213 companies exhibiting at trade fairs dedicated to E-learning, 56 companies participating in research programmes, 24 virtual universities, and 47 job / recruitment sites.

The *E-learning exhibitions* considered had been recently held (2000 /2001) in various European countries. Generally, all of them had an international focus. De facto, many of the presenting companies were located in the countries where the exhibitions took place (see Table 2).

Table 2: Addresses derived from E-learning exhibitions

Exhibition	No. of addresses	Main countries
Learntec 2000 Karlsruhe	72	Germany
e-learning exhibition and conference 2000 Manchester/London	61	UK
e learn expo Amsterdam & Paris	32	Netherlands, France, other EU countries
CeBit 2001 Hanover (E-learning part)	14	Germany
e-learning exhibition and conference 2001 Manchester/London	16	UK
Online Learning 2001 Europe London	11	UK, other European countries
ONLINE EDUCA BERLIN 2000	7	European countries
Total	**213**	

Another source were *European research programmes* dedicated to Information Society Technologies (IST) in education and training (see Table 3). The analysed projects are presented at http://www.proacte.com, a EU-funded service, promoting awareness & communicating technologies in education". After a filtering process[1] with regard to the *InclusiveByDesign* project's objectives, 56 participating companies were added to the address pool. Due to the target group of the survey, the research programmes LEONARDO, ADAPT, YOUTH, HORIZON, EMPLOYMENT have not been considered as a significant source for the project's address pool, since the European software industry has been very rarely represented within those programmes.

Table 3: Addresses derived from research programmes

Research programme	Number of addresses	Main countries
Information Society Programme (IST) – Education Area (5th Framework Programme)	43	EU
Telematics Application Programme (TAP) - Education and Training Sector Projects (4th Framework Programme)	9	
Educational Multimedia Task Force Projects (4th Framework Programme)	4	
Total	**56**	

[1] In case the projects were characterized by rather narrow end-user groups, which were not relevant for the *InclusiveByDesign* project goals (e.g., pilots or surgeons), these projects were not further considered.

Among the 24 *virtual universities* in the address pool, 16 were members of the European Association of Distance Teaching Universities (EADTU).

In addition, various thematic Web sites / mailing lists / organizations were analysed, especially:

- European Agency for Development in Special Needs Education;
- Global Applied Disability Research and Information Network on Employment and Training (GLADNET);
- Electronic Training Village (ETV);
- E-Access Bulletin;
- The European Institute for Design and Disability (EIDD).

The 47 European *job / recruitment sites* were mainly derived from a review of European Telework Online and from relevant thematic Web sites.

Finally, *scientific conferences* in the fields of universal design (e.g., UAHCI 2001, CUU 2000, Inclusion by Design 2001), assistive technologies (e.g., ASSETS), and computer-supported collaborative learning (e.g., E-CSCL) were considered, but only few companies were (visibly) present at these conferences.

3.1.3 Questionnaire

3.1.3.1 Rationale

According to an overall working hypothesis of the *InclusiveByDesign* project, it is expected that proactively designed IST products / services, within a suitable policy context, should have a positive impact on some of the non-monetary indicators of social inclusion[2]. According to a study by CE.R.FE.[3], 'education and training' is one of the five areas of human development that may be affected by social exclusion, which is represented by more than one non-monetary indicators. Examples of such indicators are 'violation of standards concerning the access to information and culture', 'limitations to geographical mobility', and 'geographic and urban marginalisation'. A step toward attempting to support the above mentioned hypothesis would be to gather evidence, by surveying what was defined as "examples of successful practice" in the area of interest from a product / service perspective, as well as from a policy perspective.

The goal of the product / service perspective survey was to identify examples of successful practice, in terms of designing and implementing proactive / inclusive technology products and services, within the European market. Those successful examples were to be screened during Phase 1 of the survey in order to select case study candidates, for the more in-depth study of successful practice examples conducted during Phase 2 of the project.

The screening instrument of Phase 1 for the product / service perspective was decided by the project partners to be in online questionnaire format, so as to reach a wide pool of participants in geographically diverse locations. Since the product / service domain addressed mainly the technology market in Europe, it would be mainly directed towards technology-literate

[2] EUROSTAT (1995). Non monetary indicators of poverty and social exclusion: final report. 77 pp. Electronically available at: http://europa.eu.int/en/comm/eurostat/research/supcom.95/02/result/result02.pdf

[3] Quinti G., (1993). Etude sur les indicateurs d'exclusion sociale. CERFE-Commission des Communautés Européennes.

businesses (more details about the pool of survey participants can be found in section 3.1.2 of this report), therefore it was decided that the English language would be a sufficient means of communication for the online questionnaire. For the same reason, online format was judged as not overly restrictive for the particular sample in question, since technology-literate businesses in Europe are known, to a very large extent, to have internet connections.

3.1.3.2 General format of instrument

The overall length of the questionnaire was designed not to exceed 15 separate items, in order to avoid making it too lengthy and unappealing for participants to fill out. However, a lot of information was included in as compact a form as possible, without sacrificing readability.

Regarding item format, each item presented several alternatives, and explicitly specified whenever it was appropriate to select all options that applied. Some (relatively few) open-ended statements existed, requesting the responder to further specify his or her answer, or to explain the previous answer, if deemed necessary.

An effort was made to phrase questionnaire items in a non-judgmental tone, so as to avoid motivating responders towards "embellishing" the image of their business, possibly by overstating their more proactive or inclusive business practices, or by understating other points where business or evaluation practices could be improved.

Another important concern in designing the online procedure of questionnaire administration was to safeguard the anonymity of responders. Through online submission participants were not obliged to unveil their identity. Furthermore, results (i.e., filled questionnaires) were available as electronic versions, facilitating direct use in spreadsheet software and thus reducing the likelihood of mistakes during data coding.

3.1.3.3 Content focus of items

The following content points were emphasised in constructing the questionnaire, in summary (for the full text of the questionnaire, please see Annex A, Product/ Service Questionnaire):

key characteristics of the product / service

- context of use (What is it? How does it render the product / service successful?)
  - Country-specific info
  - Business data
  - Company (/agency/ institute) vision
- technical and organisational requirements
- "proactive" components of the design / development processes
- degree of success in implementing proactive components, regarding:
  - the degree of addressing users of various abilities
  - any information collected on the product's or service's effectiveness and efficiency in use, as well as on user satisfaction
  - the product's or service's acceptance on the market
  - types of user feedback collected so far
  - information collected on the utility of the product / service

- the degree of meeting the enabler and outcome criteria of a theoretical (EFQM[4]) business model;
- the degree of addressing and involving diverse target user groups.

3.1.3.4 Accompanying statements

An introductory letter to the responder was included online, mailed to the same address as the questionnaire, explaining the general scope of the study as well as the survey's objectives. Access to the consolidated survey outcomes was offered to responders as an incentive for their participation. It was also announced that responders might be contacted at a later stage, with a request to participate in detailed case studies of good practice, as described.

Regarding task instructions, it was asked that each company / organization selects one specific product applicable to the domains of education, vocational training, or employment, in reference to which the questionnaire items should be answered. In case it were necessary to involve technical design, human factors professionals, or other specialists in responses to specific items, it was requested to do so, as needed.

Finally, a paragraph on confidentiality explained to respondents in detail how their identifiable information would be protected, and clearly stated that only statistically grouped and processed data would be used in any form of publishable results, also providing names and institute addresses of the survey's main contact persons.

3.1.4 Data collection

This section elaborates on the process of data collection and summarises data on the number of questionnaires sent out in the pre-test and the survey phases, as well as data on the respective feedback rates.

Before initiating the main survey a pre-test was conducted, in order to confirm the appropriateness of certain aspects of the questionnaire, but also the appropriateness of the initial letter that invited for participation, as well as that of the instructions at the beginning of the questionnaire. The pre-test phase lasted between May 14 – 30th, 2001. Nineteen addresses were chosen from the address pool, and e-mail invitations were sent to them, asking for participation within 10 days.

The fact that no feedback was returned from invited participants within the 10-day deadline lead to a number of alternative interpretations about possible reasons for the lack of responses. An analysis of the web-site log-files revealed that only one addressee had visited the web site, which reduced the number of possible interpretations. Consequently, a reminder activity by phone was initiated during the dates of May 28 – 30th, 2001, which finally resulted in 4 filled pre-test questionnaires. The online questionnaire text was followed by a feedback section, which asked for comments or critique on the survey or the questionnaire. However, no requests to change the questionnaire were received in the accompanying feedback sections within this pre-test phase. Nevertheless, internal discussions led to a reduction and simplification, both of the invitation letter as well as of the instructions, before conducting the main survey.

The main survey took place between June 3 – 20th, 2001. In total, 376 invitations were sent out, 30 of which were undeliverable due to faulty addresses. After a web-based search, 17 addresses out of the 30 were readdressed to the appropriate recipients. A reminder activity took place during the dates of June 19 – 20, 2001 and involved 277 addresses, leaving out

[4] EFQM Excellence model, see: http://www.efqm.org/model_awards/model/excellence_model.htm

those who had already responded, as well as those who had indicated that they did not wish to participate in surveys. Finally, a total of 40 questionnaires were returned, 33 of which were sufficiently filled to be usable for further analysis. Some direct responses of addressees who did not fill in the questionnaire were: not appropriate (3), don't wish to participate (1), request for payment / subcontract (2), company's policy doesn't allow participation in surveys (1).

3.1.5 Results

This section gives an overview of the survey data collected, enriched by some exemplary illustrative cases. The immediately following section emphasizes the most interesting results.

3.1.5.1 Overview

Most of the 33 respondents represented commercial firms or consultancies (79%), while the rest were private non-profit or public organizations. Small, medium, as well as large companies / organizations were sampled. The specific products / services referred to by the respondents belonged to the three focus fields of education (67%), vocational training (76%) and employment (27%) (multiple-category answers were also allowed). The target market included 12 European countries (see Figure 1).

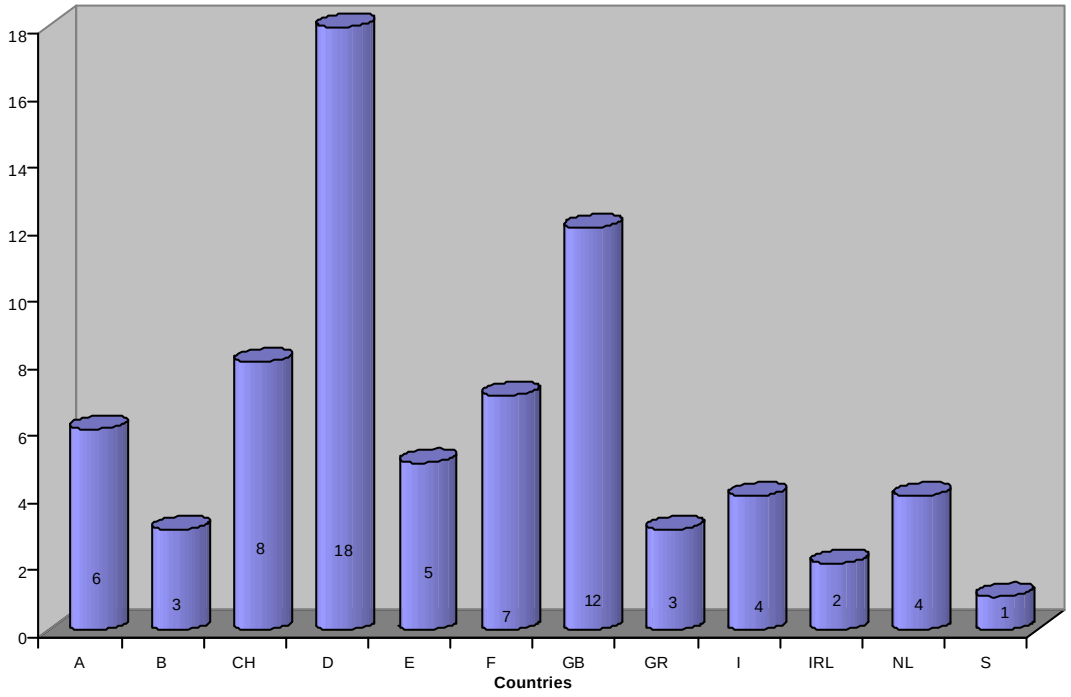

Figure 1: Target market of the referred products/services
(n=33; multiple-category responses allowed)

Regarding the market share of the products / services, around half of the respondents made an explicitly positive statement, while for the other half of the products / services either no clear market position had developed yet or no market data was available.

Two thirds of the products / services were originally designed for specific target groups. Additionally, many respondents had indications that additional user groups had evolved, other than the initially planned ones. Figure 2 gives an overview over the "covered" groups benefiting from the products / services.

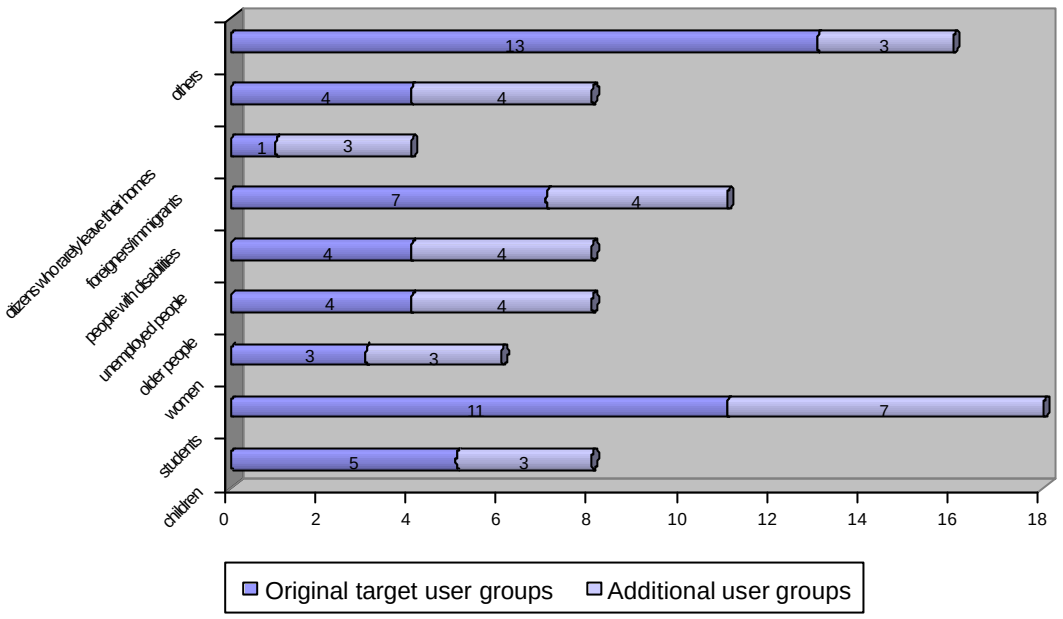

Figure 2: End user groups (n=21; multiple answers possible)

Nearly all companies / organizations measured their users' satisfaction (88%). Moreover, the products / services had been benchmarked in comparison with competitors' products regarding different criteria, e.g., ergonomics (33%), usability (45%), accessibility (30%), and even usability for "every" potential user, i.e., *inclusiveness* (21%). Current (61%) and potential / future end users (48%), as well as user representatives (42%), had been actively involved in the design and development processes. The samples involved by some of the companies / organizations were even approximately representative of the diversity of the target end users (27%).

During the development phase, the companies / organizations used various types of support in order to address diverse user groups, e.g., design / development / evaluation tools, best-practice collections, corporate guidelines or established international standards. These efforts resulted in products / services offering different types of adaptation possibilities toward diverse user needs, e.g. customisation by technicians (64%), customisation by users (52%), or automatic adaptation (27%). Other respondents (27%) claimed that their design would meet the interaction requirements of all users without the need for adaptation / customisation.

With the help of further organizational measures, 52% of the companies / organizations reported to additionally contribute to Inclusive Design, for instance via overall or specific policies / strategies, via a committed and encouraging management, by empowering employees to give their own design input, or by integrating Inclusive Design into quality management approaches.

The existence of policies, standards, and financial support was estimated as supportive for inclusive design by 85% of the respondents. Support on a European or international level was more frequently mentioned than support on a national or regional level.

Regarding the participation in in-depth case studies, 16 companies / organizations stated their explicit willingness (48%) to do so. Another 5 did not explicitly refuse and specified contact persons. This implies a maximum number of 21 case study candidates (64%).

For a more detailed presentation of the results of the policy survey, the interim project report is available at the *InclusiveByDesign* project's web site.[5]

3.2 The policy survey

3.2.1 Objectives

Regarding the policy perspective, the partners responsible for the policy survey (CNR-IROE and VFA) launched a broad survey at all policy levels (regional- national- EU) to identify and then analyse examples of policy measures in the domains of education, vocational training and employment that not only promote social inclusion but do, or could, serve as a trigger to stimulate and support the introduction and use of IST-based technologies in ways that facilitate social inclusion.

The team identified, through context analysis and a filtering process, thirty (30) indicative examples of policies which varied regarding the field of action addressed (education, employment, vocational training), their geographical coverage (i.e., national or European), their type (i.e., action plans, legislation, resolutions, etc.), their targets (i.e., target group-specific or addressed to the general population), and their source (European Commission, state, private sector, NGOs, etc.). All these examples were drawn from a wide pool of policy documents that were supportive of the introduction or use of IST-based technologies to combat exclusion / facilitate inclusion.

As a general remark, it should be noted that the policy analysis was not restricted to policies promoting either technologies designed-for-all or technologies designed to be proactively inclusive. The reason was that a wide range of policy contexts were considered as potentially supportive of social inclusion; for instance, policies promoting IST-based assistive technologies could be valuable in terms of social inclusion, in addition to policies promoting IST-based technologies "designed for all".

3.2.2 Address pool

The address pool created in the framework of the project consists of policy initiatives of:

- different geographical levels, such as European, National, regional.
- different types, such as resolutions, legislation, programmes, action plans, political Positions
- different "authors", such as the public or private sector (mostly third sector)
- different European countries (sometimes the same document was accessed from different national sources, under European guidelines, in order to check the differences among member states of the EU)
- different target groups (i.e., "specific": focused on one or more disadvantaged target groups or "general": addressed to the general population)

More in detail, the pool for the European policy level includes:

- European Directives and Recommendations that are supportive of the use of information society technologies to facilitate inclusion
- White papers, Green papers

[5] Weber, H. and Leidermann, F. (2001). Interim Report. InclusiveByDesign Consortium. Electronically available at: http://ibd.ics.forth.gr/files/interim-report.pdf

- United Nations Standard Rules on Equal Opportunities for Disabled People
- European Guidelines on Employment (Pillars on the use of IST technologies)
- European Guidelines on Inclusion (to combat poverty and social exclusion)
- European policy, programmes on mainstreaming in Education with the use of information society technologies
- Community Action Programme on Anti-Discrimination
- Quality of Life Programme (Third age)
- eEurope Initiative
- Web Accessibility Initiative (Policies relating to Web Accessibility)
- DGV (supportive policy measures for the use of IST technologies to facilitate inclusion)
- DG on Education (Policies and programmes on the use of IST technologies)
- Fifth Framework Programme
- ENGOs activities (e.g. EDF Information Society paper)
- Equal Programme
- The Promise of the Information Society (good practice on using the Information Society for the benefit of disabled and the elderly)
- Include project
- OECD, UNESCO policy on inclusion

Referring to the national / regional/ local policy level:

- A number of National Action plans on Employment
- A number of National Action plans on Inclusion
- A number of National policy measures- programmes on mainstreaming in Education with the use of IS technologies
- A number of National IT Policy plans
- National training, employment activities (programmes on combatting social exclusion)
- NGOs activities on the use of IS technologies to facilitate inclusion
- University policy, Open University
- Regional policy measures on the use of IS technologies to facilitate inclusion
- Policies to promote telework
- e-Europe-Regio
- Procurement policies of large employers (e.g., administrations) with respect to IST and accessibility /inclusion issues.

3.2.3 Results of the policy survey

3.2.3.1 Criteria/categories according to which policies have been screened

The success criteria of policy initiatives cannot be identified through the broad surveys, but through the case studies later in the second phase of the project. However, the "screening" procedure of reviewing policy documents has been formalised by using categories proposed below to help in the selection process for case studies.

Classification criteria

Key characteristic of the measure

- Issuing Subject:
  - Organisation,
  - Body,
  - Entity which issued the measure (European, national, regional, single body)
- Kind of document:
  - Normative (compulsory or not),
  - Marketing,
  - Policy framework
- Way of operating: how it works, in practice (impossible to detect). More detailed explanation (possible)

Success criteria:

- Transferability,
- Scalability,
- Data on application (if available).

Framework

- Influencing background, if any.
- Target groups:
  - All the population of a certain territory.
  - One or few special target groups, according to age, sex, culture, type of disadvantage.
  - Disadvantaged target groups in general

3.2.3.2 Policies identified

The thirty indicative policy documents have been selected from the pool of documents mentioned previously. These policy documents refer to:

Classification criteria

- **Issuing Subject**: European Commission, European Council, National Ministries, NGOs, European projects' partnerships
- **Kind of document**: Resolution, Programme, action plan, position paper, agreement between social partners etc

Success criteria:

- **Transferability**: most of the policy examples could be transferred to other countries or to other fields of action. A "transfer exercise" could be developed, taking into consideration parameters such as the context, national or local characteristics, success criteria, etc.
- **Scalability**: idem
- **Data on application**: most of them applied within the last 5 years

Framework

- **Influencing background:**

  There are many factors that have stimulated and influenced the introduction and promotion of supportive policy measures, regarding the use of IST based technologies in combating social exclusion, at European and national level. The most influential can be grouped as follows:

  - The new emerging knowledge - based society, the European strategy to prevent and combat social exclusion, the European policy on mainstreaming in education and the European strategy to promote employment possibilities are, among others, the main issues that have stimulated the introduction and promotion of policy measures at European and national level that are supportive for the use of IST as a means to combat social exclusion.
  - In most cases initiatives, programmes, guidelines or Action plans at European level have stimulated the introduction of policy measures, programmes or action plans at national level (e.g., National Action Plan (NAP) on IT, NAPEmployment, NAPIncl).
  - In some cases policy measures at national level were introduced early enough, in the mid 80s. They are the pioneers (e.g. Swedish NAP for ICT in schools, 1985)
  - Successful pilot projects on the use of IST-based technologies to facilitate education, training or employment of disadvantaged people (i.e., disabled people), introduced by NGOs or local authorities, have had positive impact on initiating relevant policy measures at regional or national level.

- **Target groups:**
  - **All the population of a certain territory:** 7 policy examples belong to this category (e.g., e-Europe: all citizens including the disadvantaged; e-Learning: all students including disadvantaged students; Norwegian NAP for ICT in Education: all students including the SEN)
  - **One or few special target groups, according to age, gender, culture, type of disadvantage:**
  - 16 policy examples exist in this category, all of them focused on People with Disabilities (e.g., Swedish NAPIncl, Portuguese Resolution on accessibility of Web sites, EDF manifesto)
  - **Disadvantaged target groups in general**: 8 policy examples are in this category (e.g. EQUAL Community Initiative, UK NAP for employment, Danish NAP for employment with emphasis on women, European guidelines on employment, etc.)

- **Fields of interest**
  - **Education:** 3 policy examples were in this field (e.g. e-Learning, Norwegian NAP for ICT in education, Swedish NAP for ICT in schools, Open University)
  - **Vocational training:** 0 (i.e., no policy examples focused exclusively on vocational training)
  - **Employment:** 1 policy example
  - **More than one fields of interest:**
    - 8 policy examples focused on vocational training and employment (e.g., EQUAL, European Employment Guidelines, NAP Employment).
    - 1 policy example (e-Learning) focused on education and training
  - **All three fields (education, voc. training, employment):** 17 policy examples cover a variety of fields (e.g. Danish NAP for IT, Standard rules, Preparatory actions to combat exclusion, etc.).

The documents selected are the following:

International documents

1. Standard Rules on Equalization of Opportunities for People with Disabilities[6]
2. Web Accessibility Initiative[7]

European documents

3. eLearning initiative EU[8]
4. Preparatory actions to combat and prevent Social Exclusion (call for proposals)[9]
5. eEurope. Communication of the 13th March 2001[10]
6. Equal initiative[11]
7. European Objectives in the fight against Poverty and Social Exclusion[12]
8. Participation for all in the knowledge-based economy[13]

[6] United Nations. (1993). United Nations Standard Rules on the Equalization of Opportunities for Persons with Disabilities. Electronically available at: http://www.unescap.org/decade/un-sr.ppt

[7] W3C-WAI Policies relating to Web Accessibility', see http://www.w3.org/WAI/Policy/

[8] European Commission eLearning initiative, see http://europa.eu.int/comm/education/elearning/

[9] http://europa.eu.int/comm/dgs/employment_social/tender_en.htm#project1999

[10] Fenoulhet, T. (2001). An introduction to activities related to Online Dispute Resolution in the Information Society at EU level (1). Retrieved (11/05/2002) at: http://droit-internet-2001.univ-paris1.fr/ve/page4_17.html

[11] http://europa.eu.int/comm/employment_social/equal/index_en.html

[12] http://europa.eu.int/comm/employment_social/soc-prot/soc-incl/approb_en.pdf

[13] ETSI. (200O). The contribution of European standardization to the eEurope Initiative: A rolling Action Plan. Version 3.3.2 (28 November 2000). Retrieved (11/05/2002) at: www.etsi.org/eeurope/Documents/eEurope_rolling_action_plan_V332.pdf

9. European Agreement on guidelines on Telework in Commerce[14]
10. eLearning (call for proposals)[15]
11. eWorking action plan 2001-2002[16]

Member States' documents[17]

12. Danish NAP for IT use by people with disabilities
13. Norwegian NAP for ICT in Education
14. Swedish NAP for ICT in schools
15. Greek NAP on Social Inclusion[18]
16. Council Resolution on the 1999 Employment Guidelines[19]
17. UK NAP on Employment
18. Irish NAP on Employment
19. Danish NAP on Employment
20. Spanish NAP on Employment
21. Italian NAP on Employment
22. Italian Government. Document on "Accessibility and IT in the civil service".
23. Swedish NAP on Social Inclusion[20]
24. Portuguese Council of Ministers Resolution concerning the Accessibility of Public Administrations Web
25. Irish Recommended Guidelines for public sector organizations Web sites

NGO's documents

26. European Manifesto on Information Society and people with disabilities[21]
27. RNIB Information Society Action Group document[22]
28. ISDAC (information Society disAbility Challenge) document on Telework[23]

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[14] EuroCommerce and UNI-Europa (2001). European Agreement on Guidelines on Telework in Commerce. Retrieved (11/05/2002) at:: http://www.union-network.org/UNIsite/Sectors/Commerce/Social%20dialogue%20agreements/Telework_English.htm

[15] http://europa.eu.int/comm/education/elearning/call.html

[16] http://europa.eu.int/information_society/eeurope/action_plan/eworking/text_en.htm

[17] The National Action Plans (NAP) on Employment of Member States for the years 1999-2000-2001-2002 are accessible via: http://europa.eu.int/comm/employment_social/news/2002/may/naps2002_en.html

[18] http://europa.eu.int/comm/employment_social/news/2001/jun/napsincl2001_en.html

[19] http://europa.eu.int/comm/employment_social/empl&esf/empl99/guide_en.htm

[20] http://europa.eu.int/comm/employment_social/news/2001/jun/napsincl2001_en.html

[21] The European Disability Forum Manifesto on the Information Society and Disabled People. Retrieved (11/05/2002) at: http://www.acesso.mct.pt/abril2000/RCattani2.doc

[22] RNIB's Campaign for Better Web Design, see http://www.rnib.org.uk/digital/eeurope.htm

Other

29. Promise project[24]

30. Open University Learner's Guide[25]

For a more detailed presentation of the results of the policy survey, the interim project report is available at the project's web site.[26]

[23] http://www.isdac.org/

[24] http://www.digitalpromise.org/report.asp

[25] http://www3.open.ac.uk/learners-guide/

[26] Weber, H. and Leidermann, F. (2001). Interim Report. InclusiveByDesign Consortium. Electronically available at:http://ibd.ics.forth.gr/files/interim-report.pdf

4 Phase 2: Case Studies

The broad surveys described in the previous section unveiled a 'snapshot' of the different perspectives on a European level to recognise trends and collect prevailing practices and policies, thus distinguishing successful examples from less successful ones.

In the second phase, a set of five case studies was performed, in order to analyse successful examples in detail. The aim was to obtain an understanding of the approaches, as well as of the framework in which they have taken place, and of what types of practices finally rendered the respective examples 'successful'.

The systematic process of selecting candidates for the case studies is described in section 4.1. The interview guidelines developed for data collection are characterized in section 4.2. The data collection and validation is described in 4.3. Chapter 5 comprises the results of the performed case studies and the relevant recommendations.

4.1 Selection of case study candidates

The examples, identified and collected in the first project phase, needed to be 'measured' in such a way as to be ordered according to their *potential* to support inclusion or to combat exclusion. Consequently, examples of good practice needed to refer to widely acknowledged and accepted indicators of social exclusion. Some of the prominent indicators of social exclusion which are of relevance for *InclusiveByDesign* and which were addressed in the case studies were: access to, and level of, education; employment status; access to information, communication and participation; access to training.[27]

As part of the preparation of case studies, the project partners used their second project meeting in Florence, Italy, to decide on the case selection process. This process needed to fulfil certain criteria:

- Capability of distinguishing between good and bad practice examples of creating inclusive products / services
- Capability of facilitating a kind of ranking among good practice examples
- Capability of eliciting the strengths and weaknesses of a certain product / service

The project participants agreed on three priority levels of good-practice criteria, all in the category of good design. Examples which did not fulfil the criteria of any of these three levels were considered to be bad examples. Within these three levels, a ranking order exists (see Figure 3).

Priority-1 Criteria:
Proactive and/or inclusive Design
[6a) 6c) 7) 8b) 8c) 11g) 11e) 13a/c) 14)]

Priority-2 Criteria:
User-centred design but not design for diversity/inclusiveness
[9) 11c) 11d) 12a) 12b) 12c) 13b/d) 6b) 8a)]

Priority-3 Criteria :
"Good" design but neither user- nor diversity-focused nor proactive
[11a) 11b) 12d) 13e)]

Figure 3**:** Initial priority levels (corresponding questions from questionnaire listed in brackets)

[27] EUROSTAT (1995). Non monetary indicators of poverty and social exclusion: final report. (77 pp). Retrieved (11/05/2002) at http://europa.eu.int/en/comm/eurostat/research/supcom.95/02/result/result02.pdf (p.21)

These initial priority levels contained the following elements:

Priority-1 Criteria: *Proactive and/or inclusive Design*

- 6a) specific target groups
- 6c) NOT designed for the average user, but for diversity
- 7) Types of support/tools/etc. for design and development for diversity
- 8b) Adaptable by user
- 8c) Automatic adaptation
- 11e) accessibility for diverse target groups?
- 11g) benchmarking regarding usability for "every" potential user (inclusiveness)
- 13a/c) representative/informal sample of diversity of users
- 14) additional contributions to inclusive design
- 6b) additional user groups
- 8a) adaptable by technician

Priority-2 Criteria: *User-centred design, but not design for diversity/inclusiveness*

- 9) measurement of user's satisfaction
- 11c) benchmarking regarding users' satisfaction
- 11d) benchmarking regarding usability (effectiveness + efficiency + satisfaction)
- 12a) involvement of current end users
- 12b) involvement of future / potential end users
- 12c) involvement of user representatives / user advocates
- 13b/d) representative/informal sample of *average* user

Priority-3 Criteria: "*Good" design*, but neither user- nor diversity-focused nor proactive

- 11a) benchmarking regarding effectiveness
- 11b) benchmarking regarding efficiency,
- 12d) involvement of external experts
- 13e) small sample for in-depth study

Furthermore, some side constraints had to be taken into consideration, namely the domain to which a service / product belonged to, the company / organisation's geographic region, a "good" market position, and the size of the organisations. These side constraints were used to ensure that not all case studies belonged to just one of these categories, e.g., addressing only one of the three domains (i.e., effectiveness criterion of the project), such as being located in a very specific European region / country only, or focusing on one company / organisation size only (e.g., SMEs), or claiming to fulfil the priorities listed above but failing user appreciation, expressed through a good market position.

First selection: (16 out of 22)

In a first refinement step, the priority-1 criteria were split in two sub-categories (Table 4):

Table 4: Sub-categories Priority 1a / 1b

Priority-1 Criteria: *Proactive and/or inclusive Design*	
Priority-1a / Criteria	**Priority-1b / Criteria**
Benchmarking (BM) regarding accessibility for diverse target groups (11e)	Specific target groups (6a)
Benchmarking (BM) regarding usability for "every" potential user (inclusiveness) (11g)	Additional user groups (6b)
Representative sample of diversity of users (13a)	NOT designed for the average user, but for diversity[28] (6c)
Adaptable by user AND Automatic adaptation (8b+c)	Types of support/tools/etc. for design and development for diversity (7)
	Adaptable by user (8b)
	Automatic adaptation (8c)
	Adaptable by technician (8a)
	Informal/occasional sample of diversity of users (13c)
	Additional contributions to inclusive design (14)

Rationale for sub-category 1a:

- Products/services claiming to be designed in an "inclusive way" should be (ideally) *accessible* (11e) and *usable* (11g) for diverse target groups. (Please note that 11e/g do not reveal the benchmarking results, but state the existence of benchmarking processes.)
- Striving for inclusive design ideally requires the involvement of *representative* samples of *diverse* end user groups. (13a)
- In many cases, designing for diversity requires adaptation of user interface and/or contents. The combination of *automatic* adaptation AND adaptability by *users* seems to be the most desirable one. (8a+b)

This sub-categorization was used for a first selection process. The rows in Table 5 refer to the 22 potential candidates for case studies, i.e., organizations which are explicitly willing to participate, and organisations which have not explicitly refused to participate.

- The left-most column contains the data record numbers.

[28] The statement "not designed for average user but for diversity" was not made by any respondent, so criterion 6c was discarded.

- The right-most column indicates if the organization is *explicitly* willing to participate in a case study.
- The other columns refer to the priority-1 criteria.
- The high-lighted columns refer to the priority-1a criteria.

In detail:

- column "target users" contains the number of target user groups
- column "additional users" contains the number of additional user groups
- column "support for diversity" contains the number of used tools, methods, etc.
- the highlighted columns as well as the column "occasional sample" indicate the "existence" of the respective items, e.g., *whether* the product /service is adaptable by users (1) or *not* (0).
- column "additional contributions" contains the number of additional organizational measures.

Table 5: 22 candidates with regard to priority-1 criteria

Record-No.	Target users	Additional users	Support for diversity	Adaptation by user	Automatical adaptation	BM reg. accessibility	BM reg. usability for all	Repres. sample of diversity	Occas. sample of diversity	Additional contributions	Willingness for case study
	6a	6b	7	8b	8c	11e	11g	13a	13c	14	Statem
1	3	3	7	1	0	1	1	0	0	3	yes
2	0	0	6	1	0	0	0	0	0	0	yes
4	0	0	0	1	1	0	0	0	0	0	
6	3	2	6	1	1	0	0	1	0	0	yes
7	0	0	3	1	0	0	0	0	0	1	yes
8	1	0	4	1	0	0	0	1	0	1	yes
9	3	7	7	1	0	1	1	0	1	0	
10	1	4	3	0	0	0	0	0	0	1	yes
11	1	0	5	1	1	0	0	1	0	6	yes
13	0	0	6	0	0	0	0	0	0	0	
15	0	2	4	0	0	0	1	0	0	1	yes
17	1	0	4	0	1	0	0	0	0	0	
19	2	5	7	1	1	1	1	1	0	3	yes
20	2	0	4	0	0	0	0	0	0	4	yes
23	3	0	5	0	0	0	0	1	1	2	yes
24	1	1	3	1	0	0	1	0	0	1	
25	1	2	5	1	0	0	0	0	0	0	yes
28	9	0	6	0	1	1	1	1	0	0	yes
29	0	0	0	0	0	1	0	0	0	7	yes
31	0	0	6	1	0	1	0	0	1	0	yes
32	0	0	4	0	0	0	0	0	0	5	yes
34	2	1	0	0	0	1	0	0	0	1	yes

Out of the 22 candidates, 16 records/organizations have been chosen in a first selection step. The record numbers are high-lighted.

- The records No. 1, 4, 6, 8, 9, 11, 15, 19, 23, 24, 28, 29, 31, 34 "fulfil" at least one of the priority-1a criteria
- Record no. 32 was chosen due to the high number of "additional contributions" (priority-1b criterion).
- Record no. 7 was chosen due to the fact that it represents the only job web site.

The remaining 6 "discarded" records neither "fulfil" at least one of the priority-1a criteria nor have they been judged as very "interesting" regarding the priority-1b criteria.

Second selection: (11 out of 16)

In a second refinement step, the 16 pre-selected records were analysed more in-depth ("informal content-analysis"). The focus of analysis was the detection of contradictions and the absence of clear indications towards inclusive design. This resulted in a reduction to 11 records.

Third selection: (7 out of 11)

In a final step, the full data records of each of the remaining 11 cases were circulated to the project partners for final review. Table 6 highlights the selection process involving individuals from all four partners.

Table 6: Results from the final selection procedure

CNR	1	8	9	11	15	19	23	28	29	31	34
VFA	1	8	9	11	15	19	23	28	29	31	34
ICS	1	8	9	11	15	19	23	28	29	31	34
ITA	1	8	9	11	15	19	23	28	29	31	34
	1	**8**	**9**	**11**	**15**	**19**	**23**	**28**	**29**	**31**	**34**

4.2 Interview guidelines

4.2.1 Business perspective

4.2.1.1 Hypotheses of the business perspective

The interview guidelines regarding the business perspective are based on the following hypotheses:

- Inclusively designed products / services are successful products, i.e., imply economical success and/or broad/heterogeneous user groups
- User involvement is one key success factor for inclusive design.
- User involvement is required throughout different phases of the development process.
- User involvement for diverse user groups imposes novel challenges (reg. methods, techniques and tools)
- A cross-functional, organizationally integrated development process is an important premise for inclusive design
- Inclusive design requires qualified and motivated employees in the software developing company

- An appropriate company policy/strategy supports inclusive design
- Inclusive design benefits from partnerships with other organizations (e.g., companies, research institutes, user organisations)

4.2.1.2 Interview topics

The interview guidelines were structured into four sections:

1) Product description and user groups

- purpose, description of the respective product(s) / service(s)
- typical customers (branches / sectors)
- market position of the product/service
- composition of the target and or actual user group especially regarding,
  - age, gender, native language
  - "professional" roles, e.g., pupils / students, employees / self-employed users, unemployed users / citizens who rarely leave their homes
  - experience / familiarity / attitude with regard to using computers
  - physiological restrictions (e.g. visual, auditory, motor capabilities)

2) Users' satisfaction, usability, accessibility

- Measurement (and improvement) of user satisfaction
  - user satisfaction surveys
  - statistical analysis of user feedback, e.g. hotline-data
  - received quality / best design awards
- Benchmarking procedures with regard to usability and / or accessibility (against products / processes and/or standards)

3) User involvement during product / service development

- description of user involvement, including goals, benefits, methods, tools, characterization of the groups being involved
- organizational aspects regarding user involvement, including organizational responsibilities; recruitment, motivation, training of involved users; time / financial effort; problems / challenges experienced

4) Organizational issues

- company's design-related experience; employees' qualifications
- company's policy / strategy; management commitment / encouragement / motivation towards inclusiveness
- integration of inclusive design into quality management / process management approaches
- external partnerships

4.2.2 Technology perspective

4.2.2.1 Hypotheses of the technology perspective

The interview guidelines regarding the technology perspective are based on the following hypotheses:

- Companies with the capability of developing inclusively designed products have adopted an iterative, user-centred design process model overall.
- Inclusively designed products are addressed to users with variable degrees of access to knowledge, either due to level of physical ability or due to residential / lifestyle characteristics.
- Inclusively designed products are designed to run on a variety of technology (both software and hardware) platforms, and can be used in a variety of contexts (home, workplace, on the move, etc).
- Inclusively designed products incorporate some sort of adaptation with regard to content, presentation of information, and / or interaction styles.
- Available industry standards facilitate inclusive design practices.
- A variety of micro-level design and development practices and techniques are relevant to inclusive design, such as adoption of modular software architectures, expert resources for knowledge acquisition, empirical methods for data collection / evaluation, and benchmarking according to established guidelines and standards.

4.2.2.2 Interview topics

There were two major goals for the technology perspective, first to create a pool of technological approaches towards design for all, and secondly to gain insight into the maturity of the technology substrate for inclusively designed products.

To assess inclusiveness of the design process, it was necessary to account for certain product qualities that are embedded into the design process, therefore proactively incorporated into product design, while not necessarily being directly perceived by the end users of the product. As a result, the technology interview was constructed with the aim of revealing as many aspects of design diversity as possible, regarding the following three parameters:

- User groups (i.e., how many different user groups are addressed by product design in each case? Are user groups differentiated on the basis of physical capability or impairment? Are user groups differentiated on the basis of other disadvantages with implications for technology access?)
- Technology platforms (i.e., how many different browsing / computing technologies can be addressed by the product?), and
- Contexts of technology usage (i.e., can somebody use the product at home, or at a public library, or at work, or while being on the move?).

The technology interview guidelines were divided into the following sections:

1) Questions regarding user / platform / context diversity addressed by the product.
2) Phase by phase narrative account of product design process, with phase categorization based on the general model of user-cantered design.

3) Questions regarding specific technology practices deemed supportive of inclusive design or design for all.

4) Questions focused on barriers / difficulties encountered, in relation to the application of inclusive design practices.

The technology interview underwent a trial run with FORTHnet S.A.'s R&D director, and three members of the HCI Lab of FORTH-ICS (D. Akoumianakis, M. Sfyrakis, L. Karefilaki). The product examined was SMART, an application designed to provide a variety of online Stock Exchange activities.

As a result of this pilot trial, the interview tool demonstrated satisfactory performance in terms of content; some weaknesses were noticed in the format, so the interview format was reorganised and integrated with its two facilitatory checklists, the Checklist of Practices and the Checklist of Barriers (see Annex B, Interview Guidelines, Part 2: Technology Interview, Sections C and D).

4.2.3 Policy perspective

4.2.3.1 Hypotheses of the policy perspective

The interview guidelines used in the context of the policy perspective are based on the following hypotheses:

- Awareness of effective policies at European, national or regional level influence the strategy of companies to produce inclusive by design products or services.
- A combination of legislation issued at different levels (European, national, regional) could create a new trend with a positive impact on companies to develop products or services in an inclusive way.
- Different types of policy measures (Directives, Recommendations, action plans, guidelines) could have different impact on companies to produce products or services in an inclusive way.
- Contact with potential customers (i.e. users associations) affect the strategy of companies to produce inclusive by design products.
- Users associations should inform, train, make aware of and stimulate companies to produce inclusive by design products and services.

4.2.3.2 Interview topics

- Awareness of effective stimulating policies at European, national or regional level.
- Policies on European, national or regional policy which have actually stimulated the organisation to inclusive design.
- Company's attitude to of different types of effective policy framework at European, national or regional level.
- Influence of potential customers and / or user associations.

4.3 Data collection, analysis and validation

The case studies were performed between April and September 2002, initialised through a letter to the first contact person and ending with a request for data validation from the companies the case studies are based on.

An initial letter was sent to the contact persons of the seven selected organisations (see section 4.1), followed by a phone conversation in the candidates' languages. Two dates for site visits were proposed to each organisation. The letter asked the organisation to confirm its participation in the best practice investigation and cited benefits thereof.

The issue of confidentiality was also addressed within this first contact letter. The companies could specify four levels of confidentiality during the interviews:

- data which is provided for publication,
- data which may only be published at an abstracted level,
- data which may not be published in any format, but is accessible to interviewers,
- data which is not accessible at all.

In addition, the contact person was informed that the organisation's case description would be forwarded to them for a final review before publishing.

In general, all seven candidates were interested in participation. However, two of the organisations[29] rejected their preliminary agreement due to time constraints. Thus, in total, five case studies were performed.

Each case study was structured into 6 interview sessions (see Table 7) Sessions A - D covered the topics described in section 4.2.1.2, sessions E / F are referred to in sections 4.2.3.2 / 4.2.2.2. The organisations were supported to choose appropriate interviewee(s) through indicated profiles.

Table 7: Interview sessions and indicated profiles of interviewee(s)

Interview session	Profile of interviewee(s)
A: Product description and user groups (see section 4.2.1.2)	Person(s) responsible for product management / customer relationships / marketing
B: Users' satisfaction, usability, accessibility (see section 4.2.1.2)	Person(s) responsible for user satisfaction surveys and / or usability / accessibility benchmarking
C: User involvement during product / service development (see section 4.2.1.2)	Person(s) responsible for managing, planning, and performing end user involvement
D: Organizational issues (see section 4.2.1.2)	Person(s) responsible for company management
E: Policy issues (see section 4.2.3.2)	Person(s) responsible for company management
F: Technology issues (see section 4.2.2.2)	Person(s) responsible for product design / development; alternatively, persons with detailed knowledge of the product design process (e.g., a project manager / supervisor with industrial or software engineering background)

[29] In section 4.1, these candidates were referred to as No. 9 and 31.

As a supplement to the initial letter, a preparation guide for each interview session was included, which provided information regarding the different case study topics to be covered. This permitted the interviewee(s) to prepare for the case study through collecting relevant data.

Based on the guidelines described in section 4.24.2, each interview session was usually performed by two interviewers. In addition to the interview data, the organisation was asked to provide additional documents to underline interview results where applicable (for example regarding design awards, or usability questionnaires). This request was rendered before and after the interview took place.

In a first step, the data collected within the five case studies was analysed separately, resulting in five case descriptions (see Annex C, Case Descriptions). For validation and to fulfil the promise of confidentiality, the organisations were requested to review their case descriptions and to return them with any comments they may wished to add, delete, or correct respectively.

In the next step the entire case study data was analysed across the five cases and synthesized in regard to the technology, business, and policy perspective (see sections 5.1 to 5.2.6.3). The recommendations finally derived from these analyses are presented in section 5.4.

5 Results and recommendations

5.1 The business perspective

5.1.1 The participating organisations

Five organisations participated in the *InclusiveByDesign* case studies: Four private companies and one public organisation. All organisations are active in the field of computer-supported education and vocational training ("e-learning").[30] Their internal processes of developing e-learning products and services range from requirements analysis, software design and implementation, content production to deployment.

One particular company exclusively concentrates on e-learning, while the other three companies have several business areas, usually related to the field of information technology. The public organisation is a higher and further education provider which is currently "virtualising" its course offers.

The four companies are small- or medium-sized, with a staff size between 2 and 80 employees. The annual turnover of the medium-sized companies ranges approx. between 4 to 7 million Euro. The public organisation has more than 1,700 employees and an annual budget of approx. 85 million Euro. However, in this particular case, there is no data available on how much personal or financial effort is assigned to the virtualisation efforts. Table 8 outlines some key organisational and financial data of the five organisations.

Table 8: Organisational and financial key data

Reference Number[31]	Type	Staff size	Turnover / revenues in 2001 (estimation)	
			of the organisation	related to e-learning products / services
1	private	2	no data available	no data available
2	private	50	4,000,000 €	2,500,000 €
3	private	80	7,000,000 €	7,000,000 €
4	private	80	6,000,000 €	400,000 €
5	public	1,700	85,000,000 €	no data available

With the exception of the higher and further education provider who directly distributes its courses to the end-users, the e-learning products and services are usually delivered to customer organisations, especially to:

- educational institutions, e.g., universities, colleges of further education, and schools,
- vocational training centres and training companies,
- private and public employers, and
- organisations in the public / government sector, e.g. libraries, drug and alcohol councils, or regional education authorities.

[30] Employment cannot be seen isolated from education and training, since the latter usually constitute a precondition for employment.

[31] ordered by staff size

The organisations are located in five different countries: United Kingdom, Italy, Ireland, Greece, and Germany. Beyond these countries, the primary target markets of the organisations include Austria, Switzerland, Australia, Canada, the USA, South Africa, and the Middle East.

Three of the organisations report being market leaders on national or regional levels, while one organisation characterizes its products as belonging to the group of the best selling in their category. In one case the market position has not clearly developed yet. All organisations are rather "young": the companies were founded between 1988 and 1998, the public organisation in 1975.

5.1.2 User groups

Across the five different organisations, the size of the actual end-user group is estimated to vary from several hundreds to several tens of thousands, culminating to even more than a million people.

The target user groups the organisations' products / services are designed for, cover diverse dimensions:

- In most cases, the products / services are designed for **adults**, from very **young** adults (15 - 18 years) up to **older** adults (54 - 75 years). In two cases, the target group also includes **children** over 6 years, as well as users of **age 75+** respectively. In another case, the product / service is actually used by children and elderly people, although these were not the original target groups.
- Usually, regarding **gender**, no explicit distinction has been made during product design. However, one organisation considers gender aspects within its research collaborations. Another organisation specifically addressed the user group of women returning to their jobs after a long period of absence.
- All organisations aim at designing products / services for **students / pupils,** as well as for both **employed** and **unemployed** users. In addition, the target groups of three organisations comprise citizens who rarely leave their homes (including people with **physical** or **psychological disabilities**, and **prison inmates**). Ethnic minorities with different native languages are considered by three of the organisations.
- The attitude to computer usage, as a user characteristic, varies in several cases. In order to cope with the challenge of satisfying the needs of users with **negative attitudes** towards computers, efforts to ensure the products' usability are estimated as indispensable.
- The products of two organisations are designed so that no previous **familiarity with computers** is required.

The needs of users with **restricted auditory capabilities** are explicitly addressed by three organisations, mainly by providing multiple, redundant output-channels. Furthermore, different target groups include users with a wide range of **literacy levels** (including users with very poor literacy skills), users with limited primary **education**, and users with **mental ill health** or **emotional deficits**.

5.1.3 Striving for usable, inclusive products and services

All organisations invest a variety of efforts towards the goal of achieving usable, inclusive e-learning products and services. In the following sections this variety is systematically outlined, and structured according to the model of human-centred design (HCD) processes contained in ISO 18529.[32] This process model describes seven categories of processes which aim at representing and including the users (needs) during the development lifecycle of interactive computer-based systems (see Figure 4). Each category (*HCD1 - HCD7*) comprises between 5 and 8 processes.

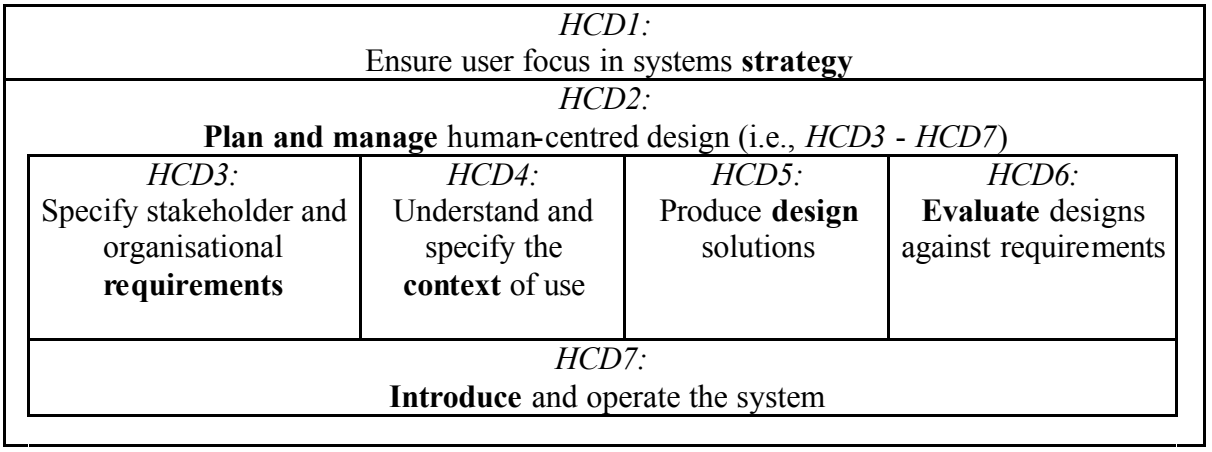

Figure 4: The seven categories of human-centred design processes (ISO 18529)

From an organisational point of view, which represents one of the three perspectives employed in the *InclusiveByDesign* approach, (i.e., the business perspective), the main emphasis was laid on the areas of participatory requirements gathering, evaluation, and organisational aspects. Thus, the business approaches analysed can be assigned to five process categories, *HCD1 - HCD4* and *HCD6*. The process categories *HCD5* and *HCD7* are not in the scope of this analysis. However, issues regarding design (including local design / customisation) are covered by section 5.2.

Referring to the relevant five process categories identified, the following subsections 5.1.3.1 - 5.1.3.5 exemplify the efforts of the different organisations. Each subsection starts with the definition of the respective process category. Then, referring to specific HCD processes assigned to this category,[33] **exemplary case study results** (across all five cases) are briefly outlined. Each individual example[34] is indicated by the following symbol: ▶

5.1.3.1 Ensure HCD content in system strategy (HCD 1)

The purpose of this process category is to "establish and maintain a focus on stakeholder and user issues in each part of the organisation dealing with markets, product concept,

[32] ISO/TR 18529.(2000) *Ergonomics -- Ergonomics of human-system interaction -- Human- centred lifecycle process descriptions*

[33] Please note that especially rather "preparatory" processes included in ISO 18529 are not explicitly mentioned. E.g., not the process of *selecting* human-centred methods and techniques (*HCD2*.3) is characterized, but the selected methods and techniques *themselves* and their *application (HCD3 - HCD6)*.

[34] Some of the examples here presented, represent a combination of several similar *individual* examples.

development and support."[35] Within the case study pool, the following examples were identified that ensure HCD content in the system strategy:

Represent stakeholders

- Within the process of designing an e-learning product, the staff responsible for script writing (i.e., for creating the product's specifications) act as corporate-internal *user advocates*, reminding the content experts as well as the graphics and technical developers that the final products are intended for use by real people and therefore have to provide a high degree of usability.

Collect market intelligence

- In order to identify forthcoming needs for systems and elicit user input regarding future systems, users are generally empowered to develop ideas for new e-learning material or courses. Annually, these ideas are directed to a group of user representatives which discusses these proposals and proposes its selection to the organisation's management.

Collect market feedback

- On fairs, the marketing staff demonstrates products to potential customers and gathers their feedback in order to refine and consolidate the system strategy.

Analyse trends in users

- A dedicated research group as well as the marketing department investigate changes in users (e.g. their skills, needs, and desires), tasks, usage contexts, and technologies, in order to estimate future needs.

5.1.3.2 Plan and manage the HCD process (HCD 2)

The purpose of this process category is to "specify how the human-centred activities fit into the whole system lifecycle process and the enterprise."[36] Within the case study pool, the following examples were identified that support this integration:

Ensure a human-centred approach within the team

- In order to maintain the staff focus on a human-centred approach, all development projects are performed by multi-disciplinary teams including script writers, content experts, usability experts, graphics designers, and user-interface developers.
- For the same purpose, the staff is continuously qualified by internal or external workshops on issues like user requirements analysis, task analysis, user-interface design, usability evaluation, and instructional design.
- The efforts to ensure a human-centred approach are additionally supported by various external partnerships, especially aiming at external evaluations by user organisations (e.g. a national illiteracy group), by educational experts, by research institutes, and by universities. These evaluations are partly performed in the context of collaborative research and development projects.

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[35] ISO/TR 18529.(2000) *Ergonomics -- Ergonomics of human-system interaction -- Human- centred lifecycle process descriptions*

[36] ibid.

Champion human-centred approach

- Human-centredness is promoted, established and communicated as a policy, e.g. within the organisation's statutes or via company's slogans (e.g., "Extraordinary E-Learning for Ordinary People").

Provide support for human-centred design

Human-centred elements are integrated in organisational support procedures (e.g. quality assurance, quality management systems or resource management).

- Human-centred activities, especially user needs analysis and usability inspections, are supported by an organisation-specific quality management system, based on the *SEI Capability Maturity Model (CMM)*[37]. This quality management system aims at achieving processes which are "repeatable" in future projects. In case of practical problems regarding these activities, the respective process descriptions are adapted to enable continuous improvement and organisational learning.
- Human-centred activities, like user satisfaction surveys, are supported by the organisation's quality management system which is certified to fulfil the requirements of *ISO 9001*.
- Practical experiences acquired during the development and evaluation of virtual courses and seminars are used to enhance the organisation's explicit design guidelines including instructional, technological and design issues.
- Efforts to achieve usable, inclusive e-learning products are externally acknowledged by a national accreditation institute. The requirements for accreditation include the conformance of the company's products with the institute's quality standards regarding "integral learner support, content, interactive design, navigation, usability, media quality, and technical quality".[38]
- The financial project budget includes resources for user needs analysis and usability evaluation, e.g. including financial incentives for users participating in evaluations.

5.1.3.3 Specify the stakeholder and organisational requirements (HCD 3)

The purpose of this process category is to "establish the requirements of the organisation and other interested parties for the system. This process takes full account of the needs, competencies and working environment of each relevant stakeholder in the system."[39]

This category overlaps with *HCD6 (Evaluate designs against requirements)*. Thus, all relevant requirement specification approaches which have been collected under the business perspective are assigned to section 5.1.3.5.

5.1.3.4 Understand & specify the context of use (HCD 4)

The purpose of this process category is to "identify, clarify and record the characteristics of the stakeholders, their tasks and the organisational and physical environment in which the

[37] Capability Maturity Model for Software, http://www.sei.cmu.edu/cmm/cmm.html

[38] The Institute of IT Training's standards - Standards for e-learning materials: http://www.iitt.org.uk/public/standards/e-learningmatsstand.asp

[39] ISO/TR 18529.(2000) *Ergonomics -- Ergonomics of human-system interaction -- Human- centred lifecycle process descriptions*

system will operate."[40] The category comprises five processes covering the identification and documentation of the user's tasks, of significant user attributes, as well as of the organisational, technical, and physical environment. However, the following examples, being identified within the case study pool, can not be differentiated on this level of detail:

- An exploratory study regarding computer usage of students with disabilities is performed. Jointly with this target group, a survey is designed which aims at eliciting the extent of computer usage, perceived benefits and drawbacks of computer usage, as well as the awareness and usage of assistive technologies by the particular group.
- Tutors who are trained in requirements gathering as well as in interview techniques visit future users at home. These tutors make use of guiding questions and follow a strict code of practice to analyse the future context of use.
- Project managers interview several future users to gather their preferences and needs, as well as their familiarity with computer usage and prior learning experiences.
- All future users are surveyed via questionnaires, e.g., regarding computer experience, navigation and Internet skills, expectations, and motivation.

5.1.3.5 Evaluate designs against requirements (HCD 6)

The purpose of this process category is to "collect feedback on the developing design. This feedback will be collected from end users and other representative sources."[41] Within the case study pool, various evaluation approaches were identified:

Evaluate early prototypes to define system requirements

- In the beginning of a project, text-based scenarios are developed which illustrate the potential usage of the system. In order to refine the requirements, the specifically trained project managers "walk" through these scenarios jointly with two or three future users which shall represent both, teachers / lecturers and students / learners. Each walk-through is performed at the customer's organisation.

Evaluate prototypes to improve the design

- (Software) prototypes are regularly presented to teachers acting as user representatives, for eliciting early feedback.
- E-learning material or courses being under development are evaluated by analysing the students' interaction behaviour during actual usage of the system in seminars.
- Before the introduction of a specific product on a particular national market, several prototype versions are presented to more than 150 potential end-users in three countries. Guided by qualitative questionnaires, the usability of the current prototypes is assessed.

Evaluate the system to check that required practice has been followed

Products are evaluated against existing standards and guidelines, both, with and without involving end-users.

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[40] ibid.

[41] ibid.

- For each project, questionnaires for measuring user satisfaction are developed. Besides domain-specific questions, these questionnaires are derived from several existing methodologies, especially *SUMI ("Software usability measurement inventory")*.[42] An exemplary questionnaire includes 50 questions derived from *SUMI*, rating user satisfaction issues on a 3-step scale, 40 complementary questions on further usability aspects (e.g., learnability, robustness, and consistency), and several questions regarding socio-demographic data, computer skills, familiarity with the system and received training, resulting in a user profile that can be related to the user satisfaction data. To enable a continuous improvement process, this procedure is performed up to four times during a project, e.g. every three months.
- The quality assurance department is responsible for the products' *usability* that is understood in this case as: "The capability of the software product to be understood, learned, used and attractive to the user, when used under specified conditions."[43] A special focus is set on error prevention and the robustness of the system. Oriented toward third-party guidelines[44], the usability of the current versions are inspected and, in addition, informally compared to other products, especially to prevalent office software products.
- During the development process, various quality standards are considered: customer-specific standards, standards agreed upon within consortia in European research and development projects, national standards, e.g., the *Becta*[45] standards that comprise technological, didactical and certain usability issues,[46] and European de-facto standards like the outcomes of the CEN/ISSS Workshop on Learning Technologies (WS/LT)[47], that include technological, legal, and quality assurance issues, as well as issues regarding multilinguality, multiculturality, and accessibility.

In addition to evaluation against standards and guidelines, products are also evaluated against competitors' products.

- During development, products are continuously benchmarked against third-party products, as well as against other in-house products., This benchmarking procedure is primarily performed by an internal expert and covers both usability and instructional aspects. The usability criteria are partly inspired by international standards like ISO 9241[48] and include (inter alia) the following issues: interaction in general, navigation, orientation, robustness, and aesthetics. In one specific case, the benchmarking pool comprised the product under development and five competitors' products. Guided by the list of criteria (in total > 40), every competitor's product was explored and compared to the company's own product. Furthermore, the company did charge an

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[42] Human Factors Research Group. SUMI. The de facto industry standard evaluation questionnaire for assessing quality of use of software by end users. Retrieved 11,04,2002 http://www.ucc.ie/hfrg/questionnaires/sumi

[43] Company's internal definition

[44] e.g., by Microsoft and Lotus

[45] BECTA.Transforming Teaching and Learning through ICT. Retrieved 11-04-2002. http://www.becta.org.uk

[46] BECTA. Connecting Schools Networking People 2000, Retrieved 11-04-2002. http://vtc.ngfl.gov.uk/uploads /text/csnp_complete-29674.pdf

[47] CEN ISSS. Learning Technologies Workshop. Retrieved 11-04-2002. http://www.cenorm.be/isss/Workshop/lt

[48] ISO. Ergonomic requirements for office work with visual display terminals (VDTs). Retrieved 11-04-2002. http://www.iso.ch

external expert with a comparative assessment of several e-learning products (including the company's own product), using a different set of assessment criteria.

- Products under development are compared to competitors' products, using existing product databases[49]. These benchmarks are rather feature-oriented and have resulted, e.g., in the optimisation of a product's navigation concept.
- Products are also compared to competitors' products in the context of awards, i.e., the benchmarking is performed by third-party organisations. One example is the *eSchola* award[50] which covers criteria like accessibility, ease of use, and appropriateness of content structure and language.[51]

Moreover, companies are engaged in the development of (de-facto) standards and benchmarking procedures on regional or national level, e.g.

- within a national working group on "Quality in e-learning", which is currently developing a benchmarking procedure including several dimensions: quality of learning content, learning methodology, learning technologies, quality of use (referring, among other topics, to aesthetics, readability, navigational support, online-help and documentation), or
- within an informal regional group "committed to exploring and disseminating best practice in the design and delivery of on-line learning".[52]

Evaluate the system in use to ensure that it continues to meet organisational and user needs

- Feedback is requested by all users, via a combination of different methods. Apart from interviews and questionnaires, focus groups are established at the customer organisations' facilities in order to gather user feedback. To accommodate the diversity of the user groups (e.g., users with restricted motor capabilities or emotional challenges), these approaches are combined with online evaluations. These mainly take place within separate, 'private rooms' of the e-learning system which are not accessible by the teachers / trainers. As a complementary procedure, evaluation topics are discussed by trainers and learners within a 'public room'.
- Virtual courses and seminars are evaluated with regard to didactical quality as well as usability. This evaluation is generally based on traditional and established evaluation methods, e.g., questionnaire-based surveys, interviews and observations. Questionnaires are sent both, online and paper-based, to all attending students. The questionnaires aim at assessing issues regarding presentation, interaction, communication, and collaboration.
- User needs evolving during the usage of the system are gathered via feedback forms which are integrated within the product. These forms enable the users to electronically direct their comments to the project manager.
- Based on questionnaires, the end-users' satisfaction is evaluated at different stages of the learning process. At the end of each training module (each course comprises

[49] provided, e.g., by BECTA, http://www.becta.org.uk

[50] eSchola. 2002. Retrieved 11-04-2002. http://www.eun.org/eun.org2/eun/en/index_eschola2002.cfm

[51] eSchola. 2002 – Criteria. Retrieved 11-04-2002.
http://www.eun.org/eun.org2/eun/en/EUN_eLearningAwards/sub_area.cfm?sa=1726

[52] ICT Learning Network. Retrieved 11,04,2002. http://www.ictlearningnetwork.bham.org.uk

several teaching modules), the learners are asked to assess the particular module, e.g., regarding the achievement of their individual objectives. The results are considered during the development of the following modules. At the end of the entire computer-based training course, the learners are requested to rate, e.g., the usability of the electronic communication features (especially e-mail and mailing lists). A separate training module on the topic of self-learning is evaluated with regard to learning pleasure, comprehension, and usability issues.

- Complementary, the learners' exams or test results are informally analysed, e.g., to discover topics in which learners performed poorly in general, in order to review the corresponding learning materials for areas of improvement. Also the general success / drop-out rates, i.e., the rate of successful / unsuccessful completion of a learning course is seen as an indicator for the system's usability.
- By tracking the number and type of learning material being accessed by the learners, or the number of accesses per learner per week, usage patterns are constructed and analysed with regard to potential usability problems.

5.1.4 Challenges

In the context of their efforts towards usable and / or accessible products and services, the case study organisations have experienced a range of challenges.

5.1.4.1 Lack of effective methods

The five organisations have explored and applied various methods for increasing the products' and services' usability and/or accessibility. In many cases, these methods were not judged as sufficiently effective, due to different limitations experienced by the organisations:

- User satisfaction questionnaires may not be comprehensible for every user, or may not cover all aspects relevant for the particular design.
- Requirements elicitation methods may not cover all aspects relevant for a design.
- Evaluation results are often too vague, ambiguous or contradictory to be transformed into explicit design requirements.
- User tracking, i.e., automatically monitoring the users' interaction behaviour in order to evaluate a running system, delivers questionable results due to methodological problems. Furthermore, there are some inherent problems in such approaches, regarding data privacy.

5.1.4.2 Lack of efficient methods

Since the organisations are increasingly forced to minimize the time-to-market, certain methods are not used any more, although they are judged as effective. Examples are

- parallel design of alternative solutions,
- participatory observation of the users' interaction behaviour, and
- in general, methods characterized by a large number of feedback loops.

Moreover, efficient methods are also needed, because the increasing diversity of the product range offered by the companies implies the challenge that less effort can be dedicated to increase the usability of one particular product (version).

Even in the case of publicly co-funded (research and) development projects, the budget available for efforts regarding usability / accessibility is usually very limited.

5.1.4.3 Coping with user diversity

Since the participating organisations strive for products and services usable for a (more or less) broad and/or heterogeneous user population, they have to cope with further challenges.

In cases where the target user group is rather diverse, many existing participatory methods are not efficient and/or practical enough. Apart from the increased time demands of involving large user samples during development, additional costs have to be considered: E.g., testing competitors' products with a large sample of end-users in order to benchmark a company's own product is rather expensive, because of high licence fees.

The diversity of the target user groups implies further methodological questions. When applying participatory methods for requirements gathering or evaluation, different challenges arise.

- The involvement of users with special psychological / emotional needs requires customised methods, e.g., a combination of physical and virtual focus groups.
- Methods characterized by a high degree of interpersonal communication (e.g., interviews, focus groups) imply challenges when involving users with certain physical restrictions, users with special psychological needs, or users from diverse cultural backgrounds.
- Methods for gathering information about diverse learning styles are still needed.

During the design process, the diversity of target user groups implies further challenges, e.g.,

- It is not obvious how to design a discussion forum which is accessible for blind people using screen readers, since there is no suitable audio metaphor currently available.
- It is not easy to support ethnic minorities using "community languages", when there is a lack of proficiency among ethnic minority users in reading or writing those community languages.

5.1.4.4 Recruitment and motivation of user samples

A major challenge when applying participatory methods for requirements collection and evaluation is to recruit and motivate end-users.

One obstacle is the fact that certain types of end-users are rarely or even never available for face-to-face communication, e.g., in the case of distance education students.

Beyond the obstacle of a missing direct access to users, many organisations face the challenge of how to motivate users to participate in requirements and/or evaluation studies. One reason might be the increasing number of surveys in general, carried out by various organisations, e.g., by marketing research companies.

5.2 The technology perspective

5.2.1 Rationale, objectives and methods of the technology perspective

The following questions reflect the main concerns of the technology analysis of inclusive design practices, regarding our target cases:

1. Are requirements and preferences of end users taken into account throughout the different phases of the development process (concept creation, requirements, implementation, testing / evaluation, marketing)?

2. How are user groups classified (what type of criterion is used for differentiating user groups)?
3. Does the product support customisation / parameterisation of the presented functionality by the end-user, in order to fulfil the user's specific functional and presentation requirements and preferences?
4. Does the company follow formal (empirical) procedures to support user centred design (i.e. formal involvement of users, formal questionnaires, field trials, etc.)?
5. Is the company familiar with the concepts of "inclusive design", "design for all" and "universal access"?
6. If yes, does it practice (adopt) such concepts in its product development cycle?
7. Even when a product is not developed by adopting design for all concepts and practices, can it be considered as a good practice example, on account of being aimed at different user groups or of supporting different platforms and/or different contexts of use?

Case study data collected from the perspective of technology aimed, at first level, at the creation of a pool of technological approaches towards user-centred design as well as design for all. At a second level this data was processed and categorised, so as to gain insight into the maturity of the technology substrate for inclusive product design.

More specifically, the technology perspective of the case studies focused on the analysis of product diversity, regarding:
a) appropriateness and usability of the product, regarding a variety of user groups; as well as
b) proactive design of product to meet requirements of a variety of technology platforms, and contexts of use.
To assess inclusiveness of product design in the selected case studies, the *InclusiveByDesign* technology perspective was set to account for qualities embedded into the product (user- / platform- / context-specific) through the design processes followed in the product's lifecycle. Those qualities are not directly perceivable by the user, but were to become evident through the analysis of the design process and methods. The instrument for this type of analysis was largely a semi-structured technology interview, built in four levels (sections):

- *Level 1*: Questions on user / platform / context diversity
- *Level 2:* Phase by phase account of product design process, based on the general model of user-centred design phases
- *Level 3*: Q's on specific technology practices supportive of inclusive design, or design for all, selected according to:
  - relevant literature
  - expert opinion
- *Level 4*: Q's on barriers / difficulties encountered relative to the application of inclusive design practices

The questions used for the technology interview can be found in Annex B, Interview Guidelines, Part 2: Technology Interview.

5.2.2 Overview of products and technologies

This section describes the type of products developed by the five companies / organisations. All of them are software products running on popular mainstream platforms (i.e. WWW, desktop). Table 9 summarises each case's technology profile by categorising:

- intended users
- platforms
- contexts of use

Table 9: Technological profile for each case.

	Product purpose	**Intended users**	**Platforms**	**Technology Usage contexts**
Case A	Asynchronous system for collaborative distance learning, with tools available to instructors for developing educational materials; product usage supported by accompanying services (instructor training, tutoring)	People of all ages, with no previous experience with computers, and also people with very diverse educational levels; gifted-talented, as well as special education users; users with physical disabilities or socio-emotional difficulties; ethnic minorities (language diversity)	Hardware: PC Software: Major web browsers; MS Windows version. (Lowest common denominator approach for technology requirements on user's side)	Access locations: home, classroom, workplace Social contexts: academic education, further education, people with disadvantaged learning backgrounds, E-Government learning initiatives, special education programmes
Case B	Online learning applications for ECDL certification	People with no previous experience with computers, including people with negative attitudes towards technology; older children (10yrs old or over) / elderly users; people with learning difficulties; (beginning to address users with physical disability)	Hardware: PC (mobile devices in preparation) Software: Major web browsers MS Windows version; Macintosh version. (Lowest common denominator approach for technology requirements on user's side)	Access locations: home, classroom, workplace Social contexts: certified technology education, further education, children, elderly, users negatively predisposed to technology
Case C	Asynchronous and synchronous client-server (also web-compatible for all major browsers) application for e-learning	Adults with basic computer skills: students in higher education or company employees in continuing vocational training, or home-bound users; people with auditory restrictions	Hardware: PC, PDA Software: Intranets (client-server technology); All major web browsers; MS Windows version; Unix / Linux version (under development)	Access locations: home, classroom, workplace, mobile devices Social contexts: academic education, further education)
Case D	Asynchronous web application for e-learning, including a 'support environment' of communications services	Traditional and non-traditional students; many working students, residents of rural areas, residents of other countries, unemployed people	Hardware: PC Software: Most web browsers (also Lynx); MS Windows version; Macintosh version; Unix / Linux version	Access locations: home, classroom, workplace Social contexts: academic education, further education
Case E	Client-server multimedia applications for distance learning	Managers, company employees; young as well as older adults	Hardware: PC Software: Intranets (Client-server multimedia technology) Internet (MS I.Explorer)	Access locations: home, classroom, workplace Social contexts: in-company education, further education

5.2.2.1 Advanced technology characteristics

Our cases exhibit the following advanced software technologies:
Case A: tracking capability for asynchronous modules 'visited' by user

Case B: tracking capability for learning material (user can begin from previously left point); Learning objects technology (in progress); considerations for mobile platforms in the near future
Case C: 3-tier architecture; tracking capability for learning material (user can begin from previously left point); multimedia technology; Learning objects technology (COM Objects); mobile platforms moderately addressed (WAP);
Case D: considerations of future synchronous support components (not currently integrated with the learning platform); considerations for mobile platforms in the near future
Case E: advanced multimedia

5.2.3 Macro-level development processes

The issues examined from the macro-level perspective of inclusive design include the overall process model followed during a product's development lifecycle, as well as normative aspects such as compliance with industry-related and usability standards or guidelines, and issues critical to inclusiveness like diversity and accessibility practices.

5.2.3.1 Process models

To various degrees (see Table 10), all companies adopt and follow major principles of user-centred design[53] (according to the ISO 13407 recommendations: (a) appropriate allocation of function between user and system, (b) active involvement of users, (c) iteration of design solutions, (d) multi-disciplinary design teams). In particular, all of our cases employ:

- Multi-disciplinary teams
- Iterative design processes with tight design-evaluation feedback loops

The dominant process model in almost all cases was user-centred design, criteria for which included empirical as well as expert-based requirements collection, design iterations, empirical evaluation & usability measurement, and benchmarking.

Table 10: Dominant process model and criteria for cases

	CASE A	CASE B	CASE C	CASE D	CASE E
PROCESS MODEL – (criteria: requirements collected empirically as well as though experts design iterations, empirical evaluation & usability measurement, benchmarking)	User-centred design (6 / 6 criteria satisfied)	User-centred design (6 / 6 criteria satisfied	User-centred design (6 / 6 criteria satisfied)	User-centred design (5 / 6 criteria satisfied) (requirements not directly collected from end-users)	Approaching user-centred design (4 / 6 criteria satisfied) (quantitative methods not used in collecting requirements / usability testing)

[53] Daly-Jones, O., Bevan, N., and Thomas, C. (1999). Handbook of User-Centred Design. INUSE Deliverable 6.2. Electronically available at: http://www.ejeisa.com/nectar/inuse/6.2/1-3.htm

5.2.3.2 Adherence and compliance to industry standards

Three of the cases (companies/ organisations) interviewed report basing their development efforts on externally established standards (see Table 11), which are either ISO-level or standards created by other well-known organisations. Four of five cases have mentioned reliance on de facto standards of the industry.

Table 11: Industry-related standards used by cases

	CASE A	CASE B	CASE C	CASE D	CASE E
INDUSTRY RELATED STANDARDS	Client-specified standards; EU project consortium standards; national gov. (Becta – technologica / didactical issues) standards; CEN/ISSS Workshop on Learning Technologies[54] (multiculturality / multilinguality issues);	Products confirm to IITT[55] quality standards	Internal quality standards (SPOCS, based on the well known CMM[56] model)	Internal (ZFE) guidelines for development of virtual courses; participation in international academic networks	Certified for ISO 9001; compliant with national industry standards

5.2.3.3 Usability standards

Regarding usability, formal standards of the type of ISO 9241 and its parts are not explicitly used. This is confirmed by the fact that most of our case companies/ organisations do not use a domain-oriented usability template, except for case B, where usability is specifically focused on e-learning and instructional design and relevant processes are formally qualified by an external organisation (IITT). Most companies / organisations, though, rely on the level of usability offered by de facto standards (see Table 12), as supported by the style-guides of their development platforms. However, usability-engineering techniques are used to facilitate transitions from concept formation to prototypes and evaluation.

Table 12: Usability-related standards used by cases

	CASE A	CASE B	CASE C	CASE D	CASE E
USABILITY STANDARDS (relevant material: usability standards; usability guidelines; benchmarking)	Becta (usability issues) standards; formal benchmarking through product competitions	IITT quality standards (usability issues); expert usability inspections; evaluation by end users; ISO 9241 (VDT's); formal benchmarking	Internal usability guidelines (SPOCS, on user satisfaction measurement); also Microsoft & Lotus usability guidelines; informal benchmarking	Experts consulted for usability (ZFE - same department consulted for educational evaluation); informal benchmarking	Internal usability guidelines; developing formal benchmarking procedures

[54] Learning Technologies Workshop, http://www.cenorm.be/isss/Workshop/lt

[55] The Institute of IT Training's standards - Standards for e-learning materials: http://www.iitt.org.uk/public/standards/e-learningmatsstand.asp

[56] Capability Maturity Model for Software, http://www.sei.cmu.edu/cmm/cmm.html

5.2.3.4 Accessibility

The term "accessibility" was given several dimensions in discussions during the technology interviews, and those are described in the relevant columns of Table 13. Apparently, however, none of the cases interviewed defined accessibility as in the ISO TS 16071 or the W3C-WAI[57]. In the W3C sense of the term, most of the cases interviewed do not use accessibility-oriented techniques. Most cases rely on mainstream accessibility features, like those embedded in Windows and do not try to incorporate additional accessibility features in their products in a design-for-all manner.

Table 13: Accessibility-related guidelines and concepts used by cases

	CASE A	CASE B	CASE C	CASE D	CASE E
ACCESSIBILITY (relevant material: accessibility standards; accessibility guidelines; accessibility concerns; accessibility solutions)	CEN/ISSS WS/LT (accessibility issues); accessibility defined as affordability / non-complexity of technical system requirements / low social pressure / low literacy demands	Auditory restrictions compensated; concerns for future compensation of low vision and motor impairment	Currently searching for accessibility-related information	Accessibility defined as non-complexity of system technical requirements, affordability	Accessibility defined as availability of instructional content in multiple modality formats
	Low product accessibility for users with impairments	*Low product accessibility for users with impairments*	*Low product accessibility for users with impairments*	*Low product accessibility for users with impairments*	*No product accessibility for users with impairments*

5.2.3.5 Diversity

Two of the five cases report to explicitly account for a high degree of user diversity, incorporating in their products provisions for disability, diverse learning styles/ backgrounds, and multilinguality. The three remaining cases have products that accommodate a medium degree of user diversity (i.e., no provision for disability, restricted or no multilinguality), and some provision for diverse learners (see Table 14).

Regarding diversity in technology platforms addressed, two of the cases exhibit medium or medium-to-high diversity in software and hardware platforms, with plans for expanding both domains. The remaining three cases exhibit medium to low platform diversity, with one of them following explicitly a 'lowest common denominator' approach to technology as a strategy for increasing accessibility of its educational services, in the sense of not imposing requirements of advanced technology on its end users.

As a generalisation, it can be argued that, in terms of product design, user diversity seems more emphasised than platform diversity across cases.

[57] Gulliksen, J., Harker, S., and Vanderheiden, G. (2002). Guidelines, Standards, Methods and Processes for Software Accessibility. Call for Papers for a Special Issue of the International Journal Universal Access in the Information Society (UAIS). Electronically available at:http://link.springer.de/link/service/journals/10209/free/gulliksen.pdf

Table 14: Diversity of users and technologies/contexts in study cases

	CASE A	CASE B	CASE C	CASE D	CASE E
5. DIVERSITY (a. users: disability, diverse learning styles/ backgrounds, multilinguality; b. platforms & usage contexts: hardware, operating systems, web browsers)	a. Relatively high user diversity (though not adequately covering disability); provision for cognitive / motivational difficulties and different learning styles/ backgrounds.	a. Relatively high user diversity (though not adequately covering disability); provision for cognitive / motivational difficulties and different learning styles/ backgrounds.	a. Medium user diversity (no provision for disability, medium provision for diverse learners)	a. Medium user diversity (no provision for disability, no multilinguality); medium provision for diverse learners	a. Medium to low user diversity (no provision for disability, no multilinguality); some provision for diverse learning styles.
	b. Relatively low diversity in software/ hardware platforms (approach of lowest common denominator)	b. Medium diversity in software/ hardware platforms, plans for expanding both	b. Medium to high diversity in software/ hardware platforms, plans for expanding both	d. Medium to low diversity in software/ hardware platforms, plans for expanding both	b. Medium to low diversity in software/ hardware platforms

5.2.3.6 Discussion of macro-level inclusive design practices

The companies / organisations that took part in the interview share some common characteristics:

Innovation

First of all, they are all actively involved in software development. Despite their typically small size, they all seem to be able to appropriate the benefits of innovation, primarily by addressing specific segments of the market (e.g. through product specialization), defined either by sector specificity, national boundaries or by common language (or all three).

User-Centred Design process model / commitment to usability

Secondly, they all seem to adopt and follow principles and practices of User-Centred Design, thus engaging multidisciplinary teams in product design and development and seeking to maximise usability through design-evaluation-redesign cycles. It appears that usability is a management commitment in all cases, which is currently facilitated mainly through low-cost usability engineering methods, such as inspections, expert reviews and heuristics (see next section on micro-level analysis). The expertise required for this kind of usability engineering comes primarily from within the companies, while some of them reported consulting external experts to improve understanding of user requirements, benchmarking, and particular usability aspects.

Emphasis on user diversity

Third, they also appear to be sensitive about diversity issues (primarily user diversity), even though their inclusive design practices for achieving this objective are still somewhat immature, especially on the technology and design-for-all sides. More specifically, a conclusion supported by the macro-level case characteristics presented in the previous

sections is that user diversity is defined in a loose rather than in a strict (i.e., methodology based, as in user modelling methodologies) manner. In the majority of cases the focus of user diversity is not so much on the user with different (i.e., non-mainstream) interaction profiles, as on different sub-categories (i.e., different social contexts or knowledge backgrounds) of the same basic user interaction profile. However, a few cases (two of five) do incorporate provisions for non-average cognitive or emotional user characteristics in their product designs.

By implication, it stands to argue that in all cases considered, prevailing macro-level processes and practices are tuned around the notions of innovation, usability and user diversity, as well as accessibility in the broader sense of the term.

Accessibility

In particular, accessibility in the broad sense represents easy access for most users. However, a more strict definition of accessibility is "the operational suitability of both hardware and software for *any* potential user"[58]. In that stricter sense, which includes the notions of accommodating disability through adaptability[59] and adaptivity[60] techniques, there is still ground to cover for all cases studied, as case interviews indicate a relative lack of efforts to design and implement techniques known from the relevant literature to serve diversity (e.g., employing adaptability, adaptivity, personalisation, etc), while design and development methods as well as tools used seem to be fairly conventional, with reliance on mainstream offerings (for instance, Windows accessibility).

In order to reach the point of accommodating the stricter definition of accessibility, steps should be taken by the companies / organisations in the direction of truly recognising diversity in user-interaction profiles as a critical parameter in technology design and finding ways to systematically classify it. Systematic classification could then be used to design access strategies for each major group, thus making it conceivable to integrate all access strategies into (ideally) one versatile and adaptable type of access technology.

In the meanwhile, it should be asserted that all cases represent very successful companies / organisations in their domains, therefore, even though the above observations may seem to point at gaps in industry accessibility practices, they cannot detract from the status of these cases as best practice examples, since accessibility in the stricter sense has not yet become common practice in the e-learning industry.

One possible explanation for this could be the lack of an articulated demand for truly accessible products in the e-learning industry. This may also justify the fact that all of these case interviews have revealed efforts to learn more about accessibility and its relevant practices, since accessibility is anticipated to become a prominent issues in the near future. In fact, this is not only supported by the overall information collected through the case

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[58] Stephanidis, C. (2001) The concept of Unified User Interfaces. In C. Stephanidis (Ed.). (2001). *User Interfaces for All - Concepts, Methods, and Tools*. Mahwah, NJ: Lawrence Erlbaum Associates, p. 373

[59] Adaptability reflects the capability of a product's interface to tailor itself to an end-user's individual characteristics or context attributes, according to information acquired proior to initiating interaction. Stephanidis, C. (2001) The concept of Unified User Interfaces. In C. Stephanidis (Ed.). (2001). *User Interfaces for All - Concepts, Methods, and Tools*. Mahwah, NJ: Lawrence Erlbaum Associates, pp. 384-386.

[60] Adaptivity characterises the interface's capability to cope with a dynamically changing or evolving situation of use, according to information inferred or extracted as the system monitors the interaction currently taking place. See
Stephanidis, C. (2001) The concept of Unified User Interfaces. In C. Stephanidis (Ed.). (2001). *User Interfaces for All - Concepts, Methods, and Tools*. Mahwah, NJ: Lawrence Erlbaum Associates, pp. 384-386

interviews, but also by the fact that there are specific plans by some of the cases examined to implement in the near future technologies that take particular aspects of accessibility into account, such as the needs of users with disabilities and scalable / mobile platforms. Notably, almost every interviewee commented on the lack of systematised and widely available accessibility-related know-how (a fact that can be considered as one of the reasons for the current state of affairs). On the other hand, this may be interpreted as lack of awareness on behalf of the companies / organisations regarding recent critical developments in the accessibility arena, such as for example the publication of the W3C-WAI guidelines.

5.2.4 Micro-level development practices: results and discussion

The examination of specific (micro-level) practices related to inclusive design aimed at supporting the conclusions drawn from examination of the macro-level aspects. Overall, conclusions from this section are supportive of those drawn in the previous (macro-level) analysis, and even the few discrepancies are underscoring some interesting and important issues in how people understand particular technology concepts and their relationship to inclusive design.

At the micro-level, the technology interviews' perspective was that inclusive design is strongly correlated to the degree of adopting (proactive) practices and methods directed or suited to a generic account of diversity at design and development time. Thus, the interview aimed to reveal inclusive design technology practices used to address diversity in all of its possible or relevant dimensions (diverse target user groups, diverse technology platforms or access terminals and diversity in the contexts of use). In this section's results presentation, the techniques examined are grouped as:

a) methods globally enhancing diversity,

b) methods for acquiring know-how,

c) methods for empirical data collection,

d) methods for concept creation / design / implementation,

e) product marketing methods, and

f) tools.

The following tables (Table 15 - Table 20) present the popularity of each practice or technique, as well as the phases of the product lifecycle where each is mostly applicable. The numbers of cases that were found to have applied each practice are grouped as "most" (3 or more cases), "few" (1 or 2 cases) or "none". The numbers corresponding to particular phases of the product lifecycle can be found below.

5.2.4.1 Methods globally enhancing diversity

Most study cases (see Table 15) were found to pursue technology-related practices which globally enhance inclusive design.

Table 15:Methods globally enhancing diversity

CODE	**Processes, Methods, Techniques**	**Practice mostly applicable to phases**	**Cases that have applied practice in at least one phase**
P1	Directly involve end-users	1, 2	most
P2	Involve user organisations	1, 2	most
P3	Check implications of available technologies on final product's accessibility	3, 4	most
P4	Check implications of different platforms on final product's accessibility	3, 4	few
P5	Check implications of different usage contexts on final product's accessibility	3, 4	most

Key of phases:
1.Concept creation & Requirements Gathering; 2. Design & Implementation; 3. Testing / Evaluation;
4. Introduction to Market

Nevertheless, a more involved view of this data requires that a few clarifications should be made. Regarding the practices coded P3 and P5 in Table 15 (i.e., checking implications of available technologies and different platforms on final product's accessibility), the overall information gathered from the technology interviews does not support the fact that "most" of our cases considered accessibility implications, at least in the strict definition of this term. However, it is true that "most" considered accessibility in the broader sense. This interpretation is also supported by the response pattern of item P4, indicating that concerns about accessibility were not necessarily focused on product scalability to a variety of platforms.

Moreover, there is no substantial evidence to conclude that specific techniques or methods are employed (e.g, embedding of technological adaptivity or adaptability in product design; see items P43 and P44 in Table 18), in such a way as to make the final product capable of addressing either disabled users or multiple types of technology platforms and usage contexts. On the other hand, interviewees often have discussed accessibility in terms of a lowest common technology denominator, which poses to a user only the most necessary and mainstream technology requirements (i.e., less complex, thus easy to fulfil). Thus any contradictory accessibility-related responses are better understood in the light of the latter interpretation of accessibility, as "affordability" and "low complexity" (regarding demands placed on the user in accessing the product or service, such as equipment needed, connection speed, or expertise in handling computers).

Table 15 also reveals that involvement of end users, either directly or through user representatives taking part in various phases in the product lifecycle, appears to be a common practice of all cases studied. This, of course, was an expected finding, since the macro-level analysis (see previous section) pointed out an explicit focus of all cases on user-centred design.

5.2.4.2 Methods for acquiring know-how

Seven of the 16 examined practices for acquiring know-how were found to be used by most case study companies / organisations. Furthermore, almost all of these methods are practiced to a small or large extent. This emphasis on knowledge acquisition appears to be related to best practice in inclusive design.

Another conclusion that can be drawn is that, in all cases studied, the extent of outsourcing for acquiring know-how is very limited. This is both expected and consistent with the findings reported in the literature regarding the way in which SMEs operate in sectors characterised by radical pace of technological change, such as the software sector. Table 16 summarises rate of usage per method used for acquiring know-how.

Table 16: Methods for acquiring know-how

CODE	**Processes, Methods, Techniques**	**Practice mostly applicable to phases**	**Cases that have applied practice in at least one phase**
P6	Review relevant literature	1, 2	most
P7	Use expert consultation	1, 2	most
P8	Acquire expertise from R&D organizations	1, 2	few
P9	Involve professionals (who know the users' requirements)	1, 2	few
P10	Outsource to expert groups	(any)	few
P11	Review and examine case studies	1, 2	most
P12	Review and examine similar products	1, 2	most
P13	Examine available technology (including assistive technology)	1, 2	few*
P14	Hire personnel expert in Inclusive Design concepts and practices	(any)	few
P15	Train existing personnel in Inclusive Design concepts and practices	2, 3	few
P16	Comply with recommendations / standards	2, 3	most
P17	Comply with regulations	(any)	most
P18	Follow usability guidelines	1, 2, 3	most
P19	Follow accessibility guidelines	1, 2, 3	few
P20	Adopt formal quality control processes (e.g. ISO 9002, ISO 13407)	(any)	few
P21	Maintain external subcontracts	(any)	none

Key of phases:
1.Concept creation & Requirements Gathering; 2. Design & Implementation; 3. Testing / Evaluation;
4. Introduction to Market

*Note: Regarding practice P13, most cases review and examine available technologies, but none appeared to explicitly take assistive technology into account. This is consistent with the conclusions of the previous section, regarding focus on accessibility issues.

5.2.4.3 Empirical data collection methods

As can be seen from Table 17, 10 of the 12 examined methods of empirical data collection are used by most of our study cases. This finding is indicative of a highly positive relation between inclusive design and extensive processing of empirical data, regarding products and users.

Table 17: Empirical data collection methods

CODE	**Processes, Methods, Techniques**	**Practice mostly applicable to phases**	**Cases that have applied practice in at least one phase**
P22	Directly involve end-users	1, 3	most
P23	Involve user organisations	(any)	few
P24	Carry out interviews	1, 3	most
P25	Carry out observations	1, 3	most
P26	Carry out surveys	(any)	few
P27	Test prototypes	3	most
P28	Test against requirements	3	most
P29	Perform usability inspections	2, 3	most
P30	Perform user-based evaluation	3	most
P31	Perform field trials	3, 4	most
P32	Collect user opinion	(any)	most
P33	Collect user complaints	3, 4	most

Key of phases:
1.Concept creation & Requirements Gathering; 2. Design & Implementation; 3. Testing / Evaluation; 4. Introduction to Market

5.2.4.4 Concept creation / Design / Implementation methods

Iterative design seems to be an important component in current inclusive design practices. Apart from that, each company / organisation seems to rely on its own established design and implementation methodologies. However, the embedding of adaptability and adaptivity features in the product (see practices P43-44) is not yet common practice in inclusive design efforts, since the type and level of diversity realised, apparently, does not necessitate investment on such strategies.

Table 18: Concept creation / Design / Implementation methods

CODE	**Processes, Methods, Techniques**	**Practice mostly applicable to phases**	**Cases that have applied practice in at least one phase**
P34	Enumerate design alternatives	2	few
P35	Conceive / Design / Develop product based on mainstream technology	1, 2	most
P36	Conceive / Design / Develop product based on in-home custom-made technology	1, 2	few
P37	Adopt specific design methodologies	2	most
P38	Adopt specific architectures	2	most
P39	Adopt open or modular architectures	2	Few**
P40	Support modular design	2	Few**
P41	Support interoperability between implementation modules	2	Few**
P42	Adopt iterative design processes	1, 2, 3, 4	most
P43	Support adaptivity	1, 2	Few***
P44	Support adaptability	1, 2	Few***
P45	Adopt specific development methods (e.g., Window-based tools)	2	most
P46	Support different development lines for each platform	1, 2	few*

Key of phases:
1.Concept creation & Requirements Gathering; 2. Design & Implementation; 3. Testing / Evaluation; 4. Introduction to Market

* Regarding practice P46, not all cases support different technology platforms. From those who do, all have used different development lines for each alternative type of software/hardware implemented. This effectively means versioning of the product to become available through another platform, rather than generic design, which is instantiated on multiple platforms, as the need arises.

** Regarding practices P39 – P41, our general evaluation of the cases' technology renders the interviewees' responses to be understatements of the existing situation, in the sense that most or all of the products discussed seem to be modular, and most seem to support a degree of interoperability between components (e.g., learning modules or courses). However, these components in the majority of cases are functional components (e.g., learning modules or courses), rather than non-functional (e.g., scalability to different platforms such as Windowing environments, Web, etc).

*** Regarding practices P43 - P44, our general evaluation of the cases' technology indicates that none of the products support adaptivity (i.e., capability of the product to diagnose user's needs / characteristics and to self-adapt its interface accordingly), whereas adaptability (i.e., capability of the software to be adapted to the user) is supported only in the most basic level, if at all. A likely explanation of the discrepancy between P43-44 question-specific responses versus overall interview results is that our interviewees may not have been aware of the exact definition for the term "adaptivity"[32].

5.2.4.5 Product marketing methods

As seen from Table 19, establishing different marketing channels for different user categories appears as an integral component of existing inclusive design practices.

Table 19: Product marketing methods

CODE	Processes, Me thods, Techniques	Practice mostly applicable to phases	Cases that have applied practice in at least one phase
P48	Establish different marketing channels for different user categories	4	most
P49	Establish different marketing channels for different platforms	4	few
P50	Establish different marketing channels for different usage contexts	4	few

Key of phases:
1.Concept creation & Requirements Gathering; 2. Design & Implementation; 3. Testing / Evaluation;
4. Introduction to Market

5.2.4.6 Tools supporting inclusive design

As evident from Table 20, questionnaires as well as compliance testing and performance measurement tools appear to be the most popular tools in the context of existing inclusive technology practices.

Table 20: Tools supporting inclusive design

CODE	Processes, Methods, Techniques	Tool mostly applicable to phases	Cases that have applied practice in at least one phase
T1	Use questionnaires	1, 3	most
T2	Use requirements collection tools	1	few
T3	Use design aids environments	2	few
T4	Use rapid prototyping tools	2, 3	none
T5	Use special design tools	2	few
T6	Use special implementation tools	2	few
T7	Use special toolkits	2, 3	few
T8	Use compliance testing tools	3	most
T9	Use performance measurement tools	2, 3	most
T10	Use usability evaluation tools	3	few
T11	Use accessibility evaluation tools	3	few

Key of phases:
1.Concept creation & Requirements Gathering; 2. Design & Implementation; 3. Testing / Evaluation; 4. Introduction to Market

To summarise findings and conclusions from the micro-level technology examination, responses support the previous finding that user-centred design is widely practiced by the selected cases. When it comes to examining practice patterns closer to design-for-all, such as

adaptability and adaptivity, or modularity and interoperability, or accessibility in the stricter sense, evidence for such practices is quite a bit more rare. For example, even when products have been designed to run on different technology platforms, these are development lines independent of each other, thus not able to transform (i.e., adapt) the same content into different output versions.

Certain interesting discrepancies between practice-specific responses (see again discussions of P3/P5 in Table 15, and P43-P44 in Table 18) and overall interview positions taken by the interviewees, point to differences regarding the conceptualisation of notions such as "accessibility" and "adaptation" in the design-for-all literature and in day-to-day software design and engineering practice. The most interesting overall conclusion is that accessibility (in the strict sense) is not seen as a pre-requisite for practicing inclusive design.

5.2.5 Technology profiles emerging from the analysis

The technology profiles of our case studies support the delineation of at least two structural patterns regarding inclusive design practices per case. It is important to examine those practice patterns within their context of existence, i.e., within the context of particular companies / organizations that operate with those patterns of inclusive practices, since each case can be viewed as its own small "ecosystem" of practices, which maintain and advance the company / organisation's presence in its national / global markets.

5.2.5.1 Pattern I

One pattern is supported by cases A and B, evidencing an intensive concern for user diversity, which represents the company's central focus. Indicative of the focus on user diversity are the following points:

a) increased focus on disadvantaged users (users with unusual / disadvantaged learning backgrounds, users with cognitive / emotional difficulties that affect learning in classroom environments, special needs education, users with negative motivation towards technology, users with physical impairments)

b) extensive efforts in collecting user requirements (action research; use of various types of experts, such as clinical and usability experts, in collecting user requirements)

c) reduced focus on advanced technologies, at least during initial stages of company development; this may be justified as an approach from the perspective of the lowest common technology denominator, in order not to overtax technology-naïve users with advanced technical requirements, as well as to boost the economic affordability of learning applications for disadvantaged users.

5.2.5.2 Pattern II

Another pattern of inclusive practices seems to emerge from the profiles of cases C and D. Those are cases characterized by:

a) an increased focus on technology, in the way of flexible web technologies and parallel lines of development in multiple software / hardware platforms, and

b) less priority placed on user diversity, although still investing heavily on the collection of mainstream users' requirements.

Since case B also exhibits some initial stages of the increased technology focus, it can be considered of hybrid type between the two above distinguished patterns of inclusive practices. In fact, Case B is of special interest, because it seems to have built technology and organisational strategies that combine the strongest attributes from each of the two patterns

described, while avoiding the weaknesses associated with each one. Case E appears to fit toward the beginning stages of the second (technology-focused) pattern, although certain aspects of this approach seem to be still missing (for instance, product compatibility with more than one web browsers).

5.2.6 Challenges of inclusive design: technology aspects

During the interviews the following issues have been identified by the interviewees, as responses to a series of questions from the interviewer(s), referring to difficulties or obstacles - in the respondent's experience - towards the goal of adopting inclusive design practices.

5.2.6.1 Case descriptions: concerns reported

Case A

Regarding structure and organization of the company: The company's size places a limit on its ability to include users with sensory impairments.

Regarding knowledge resources on inclusive design: There are limited guidelines on inclusive design; furthermore, these may not necessarily be based on best practice (i.e., they may not be empirically derived from best practice).

Regarding awareness / training on inclusive design: Time and costs of training are significant issues for this company.

Regarding cost of user-centred design practices: In the context of small companies, where management, development and instructional design responsibilities are not distributed enough, cost issues (non-monetary) exist, in terms of personal time required and long-term commitment for:

a. gaining developer's expertise,
b. devoting personal time to product's lifecycle and promotion,
c. selling and marketing

Case B

Overall view on Inclusive design: This company does not overall view inclusive design as an approach substantially different from the company's existing mode of operation, therefore they do not feel that inclusive design poses difficulties or heavy demands, regarding potential changes in this direction from existing company practices. Instead, inclusive design is viewed as an investment to product quality, and therefore as a necessary ingredient of the product lifecycle.

Case C

Regarding involvement of end users: Designing for diverse user groups is viewed as a continuously open issue; it is not a well-defined problem for designers. Also, gathering representative and diverse samples of users requires a lot of effort and time. For instance, when the company was faced with the dilemma of either preparing the requirements document on time or involving end users in data collection, they preferred to delay the deliverable in order to collect real end-users' data, viewing that as an investment of knowledge critical for the final product's quality.

Regarding knowledge resources / training on inclusive design: A general lack of widely available knowledge is noted about inclusive design topics; one of the motivation factors for the participation of this company in the *InclusiveByDesign* research was to acquire more

information on inclusive design. There is not an awareness problem within the company (or at least for particular experts within the company) concerning what inclusive design is about. On the other hand some training-related questions exist, such as "What courses are available (i.e., on particular topics of inclusive design)?". Sample topics where more information would be desirable: a) how to practice inclusive design, b) the work of W3C[61], c) open architectures.

Other concerns on inclusive design: How could the process become less time-consuming? Perhaps through standardisation, and systematic dissemination of relevant knowledge.

General view of company concerning Inclusive Design: Inclusive design has the potential of pushing the company towards using more "open" tools (open standards). It can also make the company technologically more competitive. It is definitely not an aspect to be avoided; on the contrary, the company is openly seeking the best approach to it its systematic incorporation.

Case D

Regarding structure and organization: At the moment there appears to be a lack of uniformity in the way different departments and different instructors present the contents of their courses on the web. This may be because of the absence of organisation-wide guidelines on web design or online course instructional design. Understandably, the culture of academic freedom, which supports liberty in choices of research and teaching, has not so far facilitated the adoption of uniform guidelines. However, certain special issues pertaining to web accessibility for all students, regardless of disability (such as compliance with the W3C-WAI guidelines on Accessible Web Design), might prove important for a distance learning organisation in the near future, but could only be properly addressed through the consensus of the professional community.

Regarding knowledge resources on inclusive design: There is a general lack of case studies as well as of best practice collections on inclusive design. There is also a lack of guidelines on how to practice inclusive design. Those facts do not facilitate the introduction of such practices into an information technology product's lifecycle. At the level of training or facilitating people's awareness on inclusive design, there are no official plans at the moment, so those interested in the topic are pursuing relevant knowledge on an individual basis. It would be practical to have an official policy on inclusive design, so as to facilitate and fund relevant training initiatives.

Regarding cost of user-centred design practices: When taking a course online, students are asked to give feedback (empirical data collection) after every chapter. However, data collection and processing are expensive, because some courses have over 500-600 students, and therefore evaluation is only feasible for a fraction of each course's students. Another factor that makes empirical data collection more difficult, besides being expensive, is that most of the online learning system's users do not live in geographically adjacent areas, and therefore it is not easy to arrange interview or observation sessions.

Case E

Regarding accessibility: Sometimes graphics create difficulties to the accessibility of a product. However, this company depends on the expressiveness of graphics for the particular content used in its training for management skills, as the motivational aspects of the user's "immersion" in the represented situation are absolutely key to the success of the particular type of training products. Therefore, in the case of this particular product, it would not be reasonable to follow a 'low-graphics' or 'low bandwidth' approach to demonstrate inclusive

[61] http://www.w3c.org/

design; instead, other alternatives are pursued. On the other hand, the use of XML language in the company's development lines holds great potential for achieving interoperability schemes in the future for particular domains, such as the domain of interactive e-learning applications. Since interoperability can greatly facilitate design for all practices, it can also facilitate inclusive design.

5.2.6.2 Discussion of concerns reported about inclusive design

A content analysis of the above problem statements, gathered through the technology interviews, reveals the following insights on the major difficulties that need to be surmounted by companies / organisations practicing inclusive design.

Most of the obstacles to inclusive design mentioned by interviewees fall in one of three categories:

Knowledge resources on inclusive design

Three of the five cases explicitly mentioned problems in this area, that can be grouped as follows:

- General lack of widely available knowledge on topics of inclusive design
- Lack of inclusive design guidelines; also, existing guidelines are not necessarily based on best practice.
- Lack of case studies and / or on inclusive design.
- Lack of best practice collections on inclusive design.

One interviewee pointed to the relationship between standardization and systematic dissemination of knowledge on inclusive design on one side, and time savings on the other side, regarding the incorporation of inclusive practices in the entire product lifecycle.

Awareness and training around inclusive design

Again, three of the five cases explicitly mentioned problems in this area, as follows:

- Monetary, as well as time costs for training are significant, especially for smaller companies
- Lack of knowledge concerning the availability of courses on topics of inclusive design. Sample course topics might be "how to practice inclusive design", "the work of W3C web accessibility standardization body", and "open architectures".
- Lack of official training policies on training forces those interested to self-training.
- Lack of official training policies does not encourage funding for inclusive design training.

Costs of user-centred design

Difficulties mentioned in this area refer to monetary costs as well as resource (time and effort) costs to:

- gather representative as well as diverse samples of users for prototype testing or other types of data collection
- administer testing procedures and analyse / evaluate results
- incorporate inclusive practices to the entire product lifecycle, including marketing

- train personnel.

Some of the structural / organizational aspects seem to be related to cost factors in a determining way, particularly:

- company size and resources available, as well as
- presence or absence of uniform policies regarding corporate objectives and funding for inclusive design.

In addition, the previously mentioned observation on the role of knowledge standardization and systematic dissemination seems also of relevance.

5.2.6.3 Conclusions from challenges and concerns related to inclusive design

This section takes into account the issues collectively identified as barriers in the course of the case interviews, and comments on their implications. Case interviews on technology have pointed out a host of issues related to know-how, such as:

- Lack of guidance on inclusive design
- Lack of consolidated methods fostering explicitly inclusive design
- Lack of examples of good practice
- Lack of trained professionals who could quickly stimulate developments in the direction of inclusive design or design-for-all within a company or an organisation.

It is also an overall conclusion from the interviews, that there is a lack of trained professionals in technological issues of inclusive design who could quickly stimulate developments in that direction within a company or an organisation.

All of the issues pointed out in relation to know-how support the conclusion that user-centred design is a necessary but not sufficient condition for inclusive design. In fact, they reveal a compelling need to examine precisely what inclusive design means (in operational terms), and how it relates to User Centred Design practices or, more specifically, how it can be accommodated within a user-centred product life-cycle. One aspect, which stands out very prominently, is that inclusive design requires a corporate (or, in any case, central) management commitment, as was the case for the concept of usability in the early stages of its adoption and before it became common practice in industry.

In addition, some more specific conclusions can be drawn from the present study of inclusive design technology practices. These can be summarised as follows:

1. Disabilities are not yet acknowledged as part of the pool of user characteristics (this would require an orientation towards universal design on the part of the companies) and thus not addressed during development; instead, traditional assistive technologies are still considered as an acceptable solution to the requirements for product adaptation to disability needs. Therefore, awareness-promoting policies on inclusive design should explicitly refer to the issue of accommodating disability as central and not peripheral to inclusive design practices.
2. There is a lack or shortage of tools to facilitate inclusive design: “lack” may not be completely accurate, as some tools already exist that can facilitate certain technology aspects of inclusive software design (i.e., software design tools that support the design

of inclusive products, such as design aids, or accessibility assessment tools[62]. However, there is certainly not an abundance of such tools, while the existing ones are not widely known or publicly available. This can be attributed to a shortage of relevant research, which in turn is explained by the low political prominence (and thus shortage of funding) of accessibility technologies as a research topic. Low public awareness of existing research on accessibility technologies could be reversed if this topic became a target of wide-ranging legislation, as has already happened with the issuing of section 508 in the U.S..

3. Benefits of inclusive design seem not yet clearly articulated for some of the cases, especially in relation to cost effectiveness; a few studies exist[63] that show the cost effectiveness of inclusive and proactive technology practices in software design. However, there is also a shortage of relevant research concerning the cost-effectiveness of inclusive design. Furthermore, the study of cost effectiveness requires cross-disciplinary collaborations, and therefore needs explicit support from policy and academic environments, as well as from the part of more immediate stakeholders.
4. Overall, demand for inclusive design products is not yet sufficiently articulated in the market, a fact that could be changed through the intervention of official policy stakeholders or user organisations. It appears that this condition would be a necessary one in order to provide a technology-pull towards inclusive design, so that SME's would be supported and even "pushed" into acquiring and applying knowledge relevant to inclusive technologies in their everyday practice.

5.2.7 Synthesis of conclusions from the analysis of technology

5.2.7.1 Defining inclusive design

As a synthesis from the results of this project's case studies, the definition supported for inclusive design can be organized around the concept of access diversity: ICT products must facilitate and promote social inclusion, therefore should encourage knowledge access and exchange among as many types of users as possible, in as many contexts as possible.

Users and usage contexts are, therefore, the two main targets of inclusive design. Users can be differentiated on the basis of inherent characteristics such as physical or mental capabilities, as well as on the basis of acquired characteristics, such as the various types of background (social, cultural, linguistic, academic, etc) and attitudes (e.g., attitude towards new technologies), as well as their exposure to parameters of interest (e.g., computing or communication technologies, e-learning, etc).

Usage contexts are determined by the use of specific technology platforms, as well as by the type of human activity they are embedded into (e.g., study at home versus study in classroom, versus mobile information access). The particular version of Inclusive Design in IT, that results as a concept from the *InclusiveByDesign* case studies, refers to practices attempting to accommodate as many of the above mentioned parameters, through their proactive

[62] Gary Perlman (2002). Software and hardware tools for making interfaces accessible: a list. Retrieved 11-05-2002 at: http://www.hcibib.org/gs.cgi?file=internet&terms=accessibility:tools

[63] Stephanidis, C. (1995). Towards User Interfaces for All: Some Critical Issues. In Proceedings of HCI International '95, Panel Session"User Interfaces for All – Everybody, Everywhere, and Anytime", Tokyo, Japan, 9-14 July, pp. 137-142.

incorporation into product design and development. Principles of universal design and design-for-all, therefore, do fall within the scope of inclusive design.

However, there is one more important observation that was not originally accounted for in the analysis plan, but has become evident from the best practice cases here described (for a detailed account the reader should refer to Annex C, Case Descriptions). Inclusiveness in the areas of education, training and employment involves also things other than technology design. One very important component of inclusiveness in these three areas, which heavily rely on providing some sort or other of e-learning services, is inclusive information design. This means that, apart from the accessibility of technology platforms and the low cost of equipment needed by a user to access those information and knowledge services, a very important part of success lies in instructional design, which ensures simplicity, immediacy and cognitive support in activities of information or knowledge acquisition, or exchange.

In some of the cases this is translated into heavier reliance on asynchronous rather than on synchronous information technologies, so that flexibility can be introduced into timing requirements of online collaboration and information exchange. This may be important for human beings, who tend to structure their time and activities in their own personalised ways. The characteristic of a-synchronicity in information interactions accommodates the diversity of human activities, and therefore seems to support inclusive design.

Other inclusive design components, that contribute to the success of these cases by supporting human activity, are usability in products and services (ensured by following user-centred design models), as well as quality in design (ensured by quality assurance methodologies).

To summarise, attributes of inclusive design encountered in this study are the following:

- **usability** (achieved by following user-centred process models)
- **diversity** in target user groups, and, to a lesser extent, in terms of technology platforms and usage contexts addressed (achieved through user-centred design, through design-for-all practices, and through advanced instructional design), and
- **quality** (achieved through quality assurance practices).

Furthermore, design elements that have contributed most to the inclusiveness of the examined product designs, according to the technology analysis, are the following:

- potential for asynchronous collaboration
- modular design in software as well as in information services
- embedded social support for service recipients (e.g., use of live tutors, email, etc)
- embedded cognitive support (e.g., user-friendly design of services, expert instructional design, multilinguality, product design for people with negative attitudes to information technology)
- technological platform diversity / accessibility (in the broad sense)
- low cost of equipment requirements for end-users

5.2.7.2 Some general conclusions from the perspective of technology

In addition to the above, the present study reveals that:

1. Inclusive design is not a distinct strategy of development; instead, elements of inclusive design are supported as a result of user-centred design.

2. There are different connotations for inclusive design, referring to diversity in the specific sectors of users (physical / cognitive capabilities, educational / social backgrounds, languages, etc), technology platforms and usage contexts.
3. Those who practice inclusive design make use of mostly mainstream tools, apparently not noting a need for specialized tools, other than information on inclusive design (know-how).
4. Accessibility is not seen as a pre-requisite for inclusive design by those who practice it.
5. Adaptation of presentation style and content, as well as flexible structuring of the interactive (learning) experience, seem to be the prime design approaches for coping with diversity requirements.
6. Focus on end-users in inclusive design appears to be common practice and a critical target.

5.3 The policy perspective

The topics / questions used during the policy interview are available for the reader in Annex B, Interview Guidelines, Part 3: Policy Perspective.

5.3.1 Overview of policy issues

In four out of five cases, the strategy of the companies/organizations to produce well designed products and services that are inclusive, is affected by European, National or regional policies and programmes. In one case, the strategy of the company is not encouraged / affected by a stimulating European, national or regional policy. The companies / organizations reported being involved in many projects co-funded by the European Commission, in the context of programmes such as DELTA, COMETT, Information Society Technologies, European Social Fund, etc.

In the context of these projects, guidelines and standards relevant for the design of the final products are considered. Products are designed in a way so as to meet the needs of different end users, including people who rarely leave their homes, disabled people, immigrants, etc.

The exchange of experience and the transfer of know-how among partners of the European projects has had a strong and positive impact on the policies of the companies/organizations interviewed, thus helping them to produce well designed products/services that are used by different types of users.

A few examples to mention:

- The European Association of Distance Teaching Universities (EADTU), which is co-financed by the European Commission, constitutes a major policy instrument in the case of the European distance-learning higher education institution. It is a forum in which context members exchange views, identify and adopt best practices, keep contact and co-operate. Within this context, the European distance-learning higher education institution delivers courses to different types of students (older adults, employed and unemployed people, people who rarely leave their homes, etc).
- Provisions and funding to raise ICT awareness for the general public have become the main driving factors for focusing one company's efforts on inclusive design, regarding products and services.

  The aim of the company has been to produce products and services which could be useful for "ordinary" users from different age groups and educational backgrounds.

The main stimulating policies which facilitated the company to create well designed products/services that are inclusive have been ESF funding, Regional policies (Europe-driven) and all those programmes and measures related with ICT diffusion.

The influence of national stimulating policies has also positively influenced the strategies of other case study companies, towards producing well designed products /services that are inclusive.

- In one case, the strategy of a company is influenced by the e-Government Initiative with the objective that all public services in the UK shall be on line by 2005.

  The company has been commissioned to build a virtual college for delivery to 5 UK online centres at regional level. It is planned to make the service accessible to all users, including disabled users.

- In another case, a company is implementing a project for the Ministry of Education, on multimedia applications for education. The product is planned to be designed in an inclusive way, in order to meet the educational needs of different types of users.

Regarding policies in other regions or countries that have had an impact on companies' strategies towards developing well designed products that are inclusive, all five organizations are aware of:

- The Section 508 legislation in the USA, that Government suppliers are obliged to provide accessible ICT products.
- The Australian approach of employing positive measures and economic incentives to foster products accessible to disabled people.

Two factors are considered by all five companies/organizations as the most influential toward the adoption of inclusive design practices, namely competition and customers' needs. All companies / organizations try to meet the needs of their end-users and also to be competitive against other companies at national and European level.

5.3.2 Conclusions from the perspective of policy

The main conclusions drawn from the initial document survey as well as from the case study interviews, regarding the policy perspective, are the following:

- A combination of legislation in the area of inclusive design issued at all three levels, (European/National/ Regional), would create a new trend and would affect many companies' / organizations' strategies in the direction of developing products and services that are inclusive. Norms fostering inclusive design could be contained either in technical legislation about industrial sectors (like telecommunication or ICT in general) or in legislative texts aimed at the protection of specific disadvantaged target groups.
- National and regional policies and measures are often driven by the European Commission's Recommendations and Directives. So far, European programmes / Action plans like *e-Europe* have had a very strong impact at the level of national policies.
- In Europe it is important to develop national-level legislations on inclusion, with guidelines for regional implementation. Furthermore, it is recommended to provide sufficient freedom for accommodating European standards and Directives at regional level.

- An overall European / national strategy on inclusion should involve one or more of the following aspects:
  a) Recognizing the access to ICT as a right for all citizens (thus compelling companies to produce inclusive products). Any relevant definitions should be formulated as clearly as possible, also taking into account views of the industry, which in some of the cases has expressed doubts about the methods and modalities of control that would be implemented towards the above specified cause.
  b) Establishing European Guidelines and standards on inclusive design.
  c) Stimulating companies by providing support and incentives towards adopting inclusive design practices (e.g. recommended code of practice on inclusive design, establishment of new or revision of existing certification mechanisms to assess compliance to the agreed code of practice, awareness raising mechanisms such as *InclusiveByDesign* label to certified products and services, etc.).
- Companies / organizations in principle would be willing to change their current strategy in favour of developing products or services that are inclusive, if there were increased demand from the end-users' side, as customers' needs have been considered one of the two most influential factors on their policies (See section 5.3.1). This coincides with conclusions mentioned elsewhere in this report, pointing out the need for articulating a demand for inclusive design in the designated sectors.

5.4 Recommendations

5.4.1 Business perspective

From analysis of the **business** perspective of the case studies, the following recommendations for European, national and regional funding institutions can be synthesised:

- (Further) development and dissemination is needed of
  - effective and efficient usability and accessibility methods (see sections 5.1.3.1 - 5.1.3.5 , 5.1.4.1 - 5.1.4.3).
  - practicable methods and guidelines to meet the requirements of users with special needs (see sections section 5.1.3.1 - 5.1.3.5, 5.1.4.1 - 5.1.4.3).
  - methods for the assessment of the cost-efficiency of different usability / accessibility approaches (see sections 5.1.3.2, 5.1.4.2).
  - methodologies for integrating usability / accessibility practices into quality management approaches (see sections 5.1.3.2, 5.1.4.2).
- Transnational networking would be beneficial for the adoption of inclusive design practices, e.g. through
  - the collection of evaluation results, to support benchmarking procedures (see sections 5.1.3.5).
  - the collection of evaluation results to provide input for standardization activities (see sections 5.1.3.5, 5.1.4.1 - 5.1.4.3).
  - support for collaborative (international) surveys (see section 5.1.4.3).
- Public funding should become available regarding the above mentioned recommendations

- Customer organisations should require participatory usability / accessibility approaches (as it happened in three of the five cases).

5.4.2 Technology perspective

From the **technology** perspective, and based on the previous analysis of technology of the cases selected, the following recommendations can be given as priority actions to industry and organisations that wish to better incorporate inclusive design into their already existing user-centred design practices:

- Exploit existing accessibility features in basic (mainstream) software technology: Adoption of recent technological developments, which advance the accessibility of mainstream technology platforms (e.g. Web) and the services built on top of these platforms, should be promoted, so as to facilitate a minimum of accessibility being built into mainstream products, thus making them more inclusive. For example, W3C has started to invest on greater accessibility of Web technologies, but these developments do not seem to be followed by industry (there was not much evidence of W3C guidelines being followed, or even known by most of the cases examined, although this would certainly increase inclusiveness for their products). Also accessibility initiatives by mainstream technology vendors such as Microsoft and Sun were not found as being appropriated for the purpose of inclusive design; in other words, the specific tools and features embedded in mainstream technologies in the form of API's (Application Programming Interfaces)[64] or other means are not being used or exploited to the cause of inclusive design.
- Facilitate early accounts of accessibility with dedicated software technologies: Efforts should be invested to raise industry's awareness of the availability of dedicated technologies or technological know-how, which can be used to address the needs and requirements of diverse user groups, including disabled and elderly. By the term 'dedicated technologies', reference is made to tools[65] available to facilitate early accounts of accessibility. For example, there are various tools which can be used to assess the accessibility of Web pages but these were rarely identified (in the sample studied) as being widely used. Moreover, the technological know-how which drives such tools and which is available in the form of de facto standards or guidelines (e.g. W3C-WAI) does not seem to influence development practices so far, therefore efforts should be invested on increasing public awareness of those de facto standards.
- Incorporate accessibility / inclusiveness checkpoints into iterative design cycles (macro-level development processes): There must be particular points established in the development lifecycle of inclusive products where accessibility evaluation becomes part of the re-design iterations. Although user-centred design appears as an accepted development strategy, it does not suffice as a mechanism for stimulating inclusive design. In other words, the tight design-evaluation-redesign cycle by itself cannot guarantee inclusive design, because regular usability evaluations may never open issues of disability needs (user testing is usually done with small samples of "average" users). Such a call for iterative development should be further enhanced to

[64] API's are standard sets of rules that allow software applications to communicate with each other, thus they are of major importance for achieving interoperability between mainstream and assistive technologies. For more on interoperability (and how to ensure it exists in software being purchased), see: http://projects.accessibilityforum.org/iopdocuments/workingdocuments/Software%206-03-02.html

[65] Gary Perlman (2002). Software and hardware tools for making interfaces accessible: a full list. Retrieved 11-05-2002 at: http://www.hcibib.org/gs.cgi?file=internet&terms=accessibility:tools

provide explicit measures and checkpoints in the direction of inclusive design. For example, checkpoints during requirements elicitation may lead to a broader and deeper understanding of how different users may used operate in different circumstances. There were no mentions of accessibility evaluations or concerns early in the product design process in the interviews; on the contrary, there have been accounts of attempts to "adapt" products for physical or cognitive disability requirements after "mainstream" versions had already been created, which, of course is more difficult.

- Develop methods / techniques specific to inclusive design (micro-level development processes): Although there is a wide range of techniques and methods stemming from user-centred design, they frequently come in generic forms which limits their application and exploitation in the context of inclusive design. Consequently, systematic efforts are needed to validate /refine /extend these techniques and /or build new ones as necessary, in an attempt to compile a corpus of inclusive design showcases and good practice, thus easing the task of assimilating and internalising inclusive design. Practices characteristic to design for all could be used to enhance inclusive design, but also other practices must be generated that are more content- or domain-oriented, as product inclusiveness has been found to have strong cognitive and socio-cognitive (attitude) components.
- In order to reach the point of accommodating the stricter definition of accessibility, steps should be taken by the companies / organisations in the direction of truly recognising diversity in user-interaction profiles as a critical parameter in technology design and finding ways to systematically classify it. Systematic classification could then be used to design access strategies for each major group, thus making it conceivable to integrate all access strategies into (ideally) one versatile and adaptable type of access technology.
- An organisational aspect that, unexpectedly, emerged from the technology interviews was that introducing inclusive design into a company's or organisation's practices necessitates several inter-dependent levels of planning, regarding technology and knowledge resources, financial resources, and long-term objectives of the company / organisation. A critical factor for facilitating the early stages of inclusive design is a corporate (or, in any case, central) management commitment for creating consensus in this direction. In fact, its absence can be equally as critical, just as was the case for the concept of usability in the early stages of its adoption and before it became common practice in industry.
- The European Commission has recently (September 25th 2002) adopted a Communication[66] on improving the accessibility of public web sites, considered an important step forward for the disability movement towards an inclusive Information Society. With this Communication, the Commission is supporting European Institutions and Member States in adopting and implementing guidelines which enable people with disabilities and older people to use the Internet more easily. It is therefore suggested that companies and organisations use the technical recommendations provided in this report to develop proposals that fit the relevant specifications (guidelines) of the Commission and claim dedicated funding as described in the above mentioned EC Communication.

[66] http://www.edf-feph.org/Papers/wai_pages/CORDIS%20News%20service.htm

- Furthermore, the new Communication of the European Commission links up with the important initiatives stated in the recent Communication "Towards a Barrier-Free Europe for persons with disabilities"[67], and the European Disability Forum (EDF) believes that its adoption will assist other mainstream targets under the eEurope initiative, such as eCommerce or eLearning[68]. It is, therefore, further suggested for all parties interested to research the relevant initiatives and possibly attempt to participate in them.

5.4.3 Policy Perspective

The drafting of recommendations regarding the policy perspective requires a reflection and synthesis on the results and recommendations of the technology and business perspectives, so that recommendations derived at the policy level refer to requirements and needs also identified in the context of the other two perspectives.

In general, access to ICT should be recognized and promoted as:

- a human right,
- a political priority
- a social responsibility

at the European / national / regional levels.

Recommendations in this section address the European and the national / regional levels.

5.4.3.1 Policy recommendations: European level

Taking into account the E.C. competition policy[69], which sets specific constraints regarding the extent to which EU institutions (e.g., the EU Parliament, the EU General Directorates, various standards bodies, etc) can intervene to the functioning of the market, there are certain limits to the possibilities such institutions might have to positively influence the market towards the directions outlined by the *InclusiveByDesign* project. Considering those limits, as well as the needs that have been identified so far, policy recommendations are as follows:

- *With respect to accessibility and usability in general,* policies to promote and facilitate inclusive design of ICT products and services in general, such as the eEurope – 2005 Action Plan[70], are likely to act as catalysts, regarding both demand for and supply of products and services that embody principles of inclusive design. Such kind of policies may be formulated as European directives or as EU legislation which, however, should in a subsequent stage be taken up and implemented at national and regional levels. To some extent, such policies are independent of sectoral characteristics, in the sense that they should focus on the ICT industry at large and seek to promote accessibility and usability.
- the EU institutions should take steps towards the recognition of access to ICT as a human right, especially in the case of disabled people, and towards the adoption of

[67] Communication from the Commission of the European Communities to The Council, The European Parliament, The Economic and Social Committee, and The Committee of the Regions, Towards a Barrier-Free Europe for Persons with Disabilities, 12 May 2000. Retrieved 11-05-2002 at: http://europa.eu.int/eur-lex/en/com/cnc/2000/com2000_0284en01.pdf

[68] http://www.edf-feph.org/en/policy/is/is_news_co.htm

[69] See the website: http://europa.eu.int/comm/competition/index_en.html

[70] See the website: http://www.eeurope-standards.org/

appropriate norms at the European level; such norms will need to be adopted and implemented by national and regional governments, to ensure that products and services sold / distributed within a country, geographic region, or Europe as a whole, meet designated criteria for inclusive design. Such criteria will need detailed specification in due course.

- *Regarding existing European policies* that can support inclusiveness, in the context of the European Employment Strategy (EES) and under the specific priorities related to 'Adaptability of Enterprises and the Workforce' and 'Equal Opportunities', which constitute major pillars of EES, the annual guidelines addressed to the member-states could emphasize the importance of the adoption of inclusive technologies. Also the Decisions of the Lisbon Summit on Combating Social Exclusion and Poverty[71], though they have not yet acquired the same level of influence as the EES (both at policy and political levels), are gaining importance and can thus promote effectively in the future the adoption of inclusive technologies in the context of policies that combat exclusion.
- *Concerning the market (both demand and supply aspects),* and under the assumption that 'demand influences supply', the extent of awareness of what technology can offer with respect to accessibility and usability can be a strong determinant of the way the market responds to specific needs. In that sense the *articulation of needs,* or, in other words, the raising of public awareness, is of primary importance. On the other hand, it is evident from the business and technology analysis and recommendations that the 'market' needs the support of the EU institutions, regarding the development and adoption of know-how related to the production of inclusive goods and services. To this end:
  - ✓ The European Commission could support *networking* between research institutes, social partners and industry, in order to enable and facilitate the dialogue between manufacturers or potential client groups and researchers with regard to inclusive technologies. Such networking should seek to promote and disseminate good practice and experience, as well as to facilitate awareness raising, technology transfer and knowledge exchange. The potential results of such activities can vary, ranging from the development of new (inclusive) products, to the formulation of mutual voluntary agreements among industries of the ICT sector with respect to new standards and rules, to the certification of inclusive products and services.
  - ✓ The Commission could support the dissemination of results, as well as the follow-up activities of relevant completed projects, in the context of plans aiming at *raising public awareness and informing the industry* about the opportunities arising from the adoption of inclusive know-how.
  - ✓ It should be noted that, as in the case of new technologies in general, there is lack of *structured information* about the possibilities offered regarding accessibility and usability of ICT. Thus, any effort in this direction is highly recommended.

[71] European Commission, Employment & Social Affairs DG (2001). Community Action Programme to combat social exclusion 2002-2006. Retrieved 10-11-2002, at http://europa.eu.int/comm/employment_social/soc-prot/soc-incl/guidelines_en.pdf

- ✓ The EU institutions could act as 'pioneer clients', by purchasing inclusive technologies for their services and operations.
- ✓ At the European level, specific initiatives towards the promotion of the image of inclusive technologies and their Social Responsibility aspects could be launched. For example, inclusive design principles could be incorporated in the SA 8000 certification or within the framework of Corporate Social Responsibility. In other words, accessibility/ usability certifications for ICT can be acknowledged as quality criteria in the ICT sector. In the future, this acknowledgment could acquire a specific character through the award of an 'inclusiveness label', given either by a European board, as in the case of Ecolabel (environment-friendly products)[72] or by an independent body like the Swedish Confederation of Professional Employees (TCO)[73], to certify inclusively-produced ICT products, or the companies that have produced them. In such cases, the role of the EU institutions could vary from simply supportive to fully dedicated. The ICT sector and the consumers' side have a major role to play in this context.

As a final remark, recommendations addressed to the European Commission can be promoted to a significant extent through existing programmes and initiatives. For instance, transnational networking is encouraged and co-financed in the context of the 'Leonardo' and the 'Socrates' programmes (education, training and inclusive technologies could be discussed in such a context), while the 'EQUAL' initiative may also offer opportunities for applying inclusive technologies. Additionally, the 6th Framework Programme for Research can offer very good opportunities for developing and testing new products and services.

The European Day of Disabled People is also a very good opportunity for targeted public awareness campaigns.

5.4.3.2 Policy recommendations: national / regional level

At the national/ regional level only general recommendations can be put forward, taking into account the varying contexts in which national / regional policies are formulated and implemented.

National / regional governments could foster inclusive technologies through:

- o *Adopting accessibility and usability as a political priority*, by considering how European directives and initiatives promoting e-inclusion can be accommodated into national regulative clauses or legislation.
- o *Sector - oriented policies*: i.e., facilitating the industry in developing and incorporating inclusive technologies through the implementation of stimulating policies, in the direction of providing economic or "image" incentives to the companies which undertake inclusive design. Such incentives could take the form of:
  - ✓ Free consultancy on regulations by competent bodies
  - ✓ Financial support for research

[72] see the web site: http://www.europa.int/comm/environment/ecolabel

[73] see the web site: http://www.TCO.se

- ✓ Interface of industry with users' panels
- ✓ Economic incentives, either direct (e.g., through co-financing of investments) or indirect (e.g., through tax incentives)
- ✓ A kind of *InclusiveByDesign* logo established for companies that follow a voluntary code of practice on inclusive design

- o *Supporting research*: It would be advisable that a phase of pre-competitive research is established, during which the intention of the state to support inclusive products is clearly articulated (financing R&D, linking research and production, etc).
- o *Promoting the use of inclusive technologies,* through
  - ✓ *Creating demand:* The national / regional governments could act as 'pioneer clients' by purchasing inclusive technologies for their services and functions. In such a case, educational and Vocational Education and Training (VET) systems could be at the 'heart' of such a practice. The benefits from introducing inclusive technologies in the area of education and training are important.

    Measures in this direction could also be guidelines necessitating that products produced, sponsored or used by Government agencies must be accessible, according to *InclusiveByDesign* principles (i.e., educational software, ICT equipment used at school or within Government-funded services). For instance, see U.S. Section 508, whose primary purpose is to provide access to and use of Federal executive agencies' electronic and information technology (EIT) by individuals with disabilities)[74].
  - ✓ *Promoting inclusive technologies:* The established social dialogue channels could serve the purposes of the promotion of inclusive technologies. The interested target groups and the research community can contribute significantly towards this end.

In addition to the above, it is of critical importance that measures are taken towards

- o ***Promoting the articulation of demand for inclusive products:*** To this end,

  a) customers either individually or through representative organisations should demand products that have been designed for inclusiveness. In this context, public awareness campaigns should be promoted and launched by associations, chambers of commerce and government agencies. These should be targeted activities, aiming to progressively lead to a change of user attitude towards inclusive design; and

  b) citizen associations should engage into targeted efforts to explain the long-term benefits of inclusive design to individual members and citizens, so as to stimulate a demand for inclusive design.

[74] see the web site: www.section508.gov

6 Evaluation

This chapter documents the project evaluation as it has continuously taken place, during the project's lifetime.

The project evaluation constitutes an important task within the partnership. It is structured along two axes: effectiveness (see section 6.1) and efficiency (see section 6.2) with the additional aim of 'continuous improvement'. ITA and CNR-IFAC, the project partners responsible for evaluation, during the second project meeting introduced the consortium to the procedures to be followed and the key criteria against which effectiveness and efficiency were to be judged. The 'continuous improvement' process was ensured through the incorporation of internal evaluation procedures within the overall project management scheme.

The project dissemination procedures are outlined and analysed in section 6.3.

6.1 Effectiveness

The effectiveness of the project has been evaluated against the following key criteria:

1. coverage of the four foci of interest: technology, business, local / regional and national / European scope (see section 6.1.1);
2. coverage of the three main target areas: employment, vocational training, and education (see section 6.1.2); and
3. identification of best practice examples, according to widely accepted indicators (see section 6.1.3).

6.1.1 Coverage of the four foci

To ensure application of the first key criterion, each partner was assigned to, and held responsibility for one of the levels of interest (FORTH - technology, ITA - business, CNR-IFAC - local / regional and VFA - national / European scope). Therefore, clear work assignments in the project guaranteed the fulfilment of this aspect.

In practice, the two policy-related levels of analysis (local / regional and national / European scope) could not be easily separated, therefore the two participants responsible (CNR-IROE and VFA) divided and surveyed the pool of policies in two parts. Regarding technological and business-oriented aspects of the process, the design survey questionnaire acknowledged both perspectives equally (see interim report).

6.1.2 Coverage of the main target areas

InclusiveByDesign set the focus of analysis on the three main domains of employment, vocational training, and education. Consequently, the address pool for the technology and business process survey constituted of company addresses that were active in one or more of these areas.

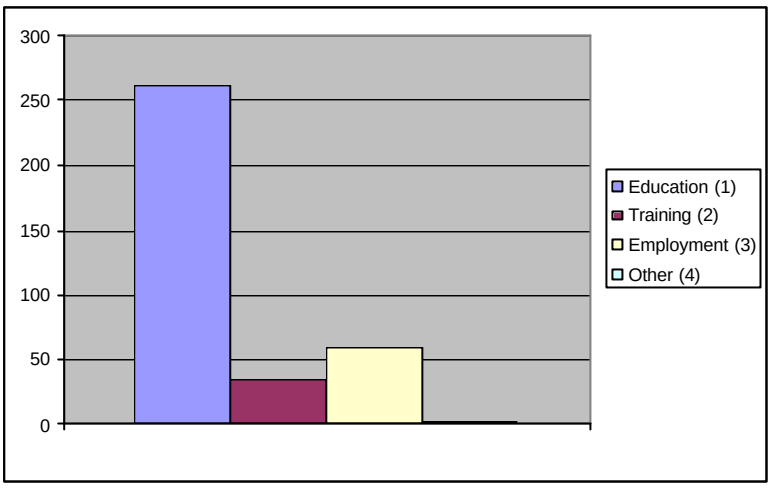

Figure 5: Preliminary distribution of domains in address pool (main area only)

Figure 5 shows a clear dominance of the educational field in the address pool, when domain is judged by main area of application. However, survey results support that product or service developers most often categorised their respective products / services as applicable to more than one of the three domains of interest. In practice, products and services can often be used in both the educational and vocational training domains without the need for any technological adaptations. The main difference is in the content, but not on platforms and technologies.

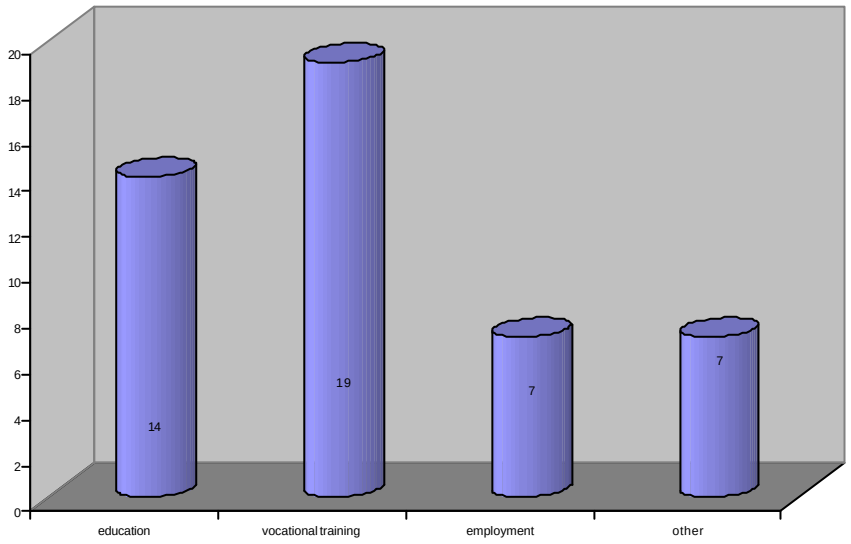

Figure 6: Distribution of domains in responses
(N=33, n=24, multiple-category responses allowed)

Accordingly, the cumulative distribution of application domains in the group of respondents differs from the previous distribution of main application areas, as multiple-category responses were allowed. Here (see Figure 6), products / services from the domain of vocational training were prevalent. It could be expected that the cumulative domain distribution of the sample would be different from the preliminary distribution of Figure 5, if

the developers themselves had explicitly attributed their products / services to the domains. Unfortunately, a categorisation of the address pool ex post is not possible.

The distribution of domains being represented by the five organisations that finally participated in the case studies is visualised in Figure 7.

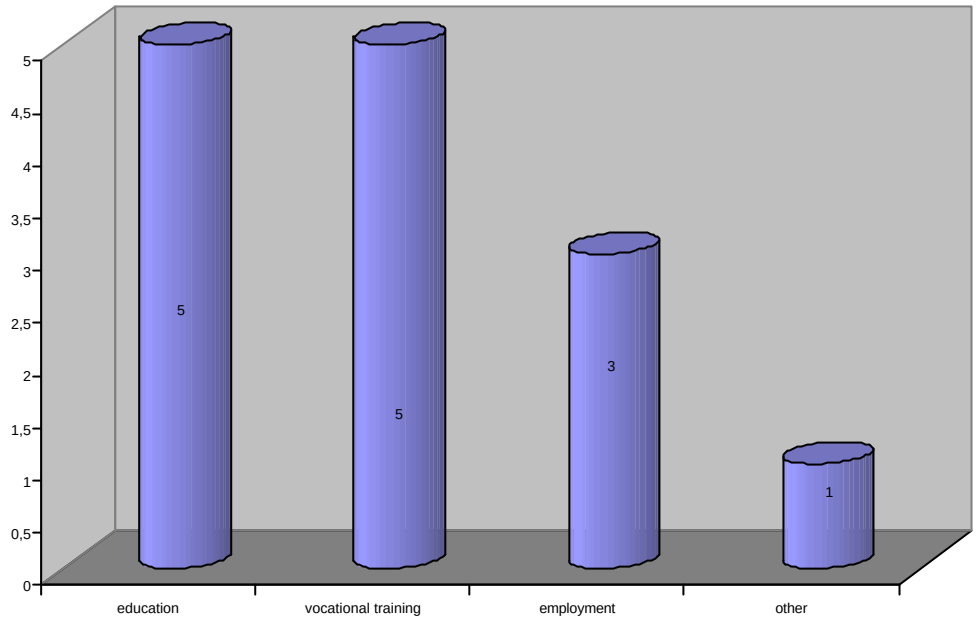

Figure 7: Distribution of domains for case study participants
(n=5, multiple-category responses allowed)

6.1.3 Identification of best practice examples

This criterion required more detailed analyses. As described comprehensively in section 4.1, the examples identified in the first project phase were 'characterised' with the help of certain criteria in such a way, as to be ordered according to their potential to support inclusion. However, the complexity of the concept of exclusion is understood, and consequently the measuring instruments are equally complex. As *InclusiveByDesign* aimed at identifying examples of good practice where technology has been developed and deployed that supported integration or combated exclusion in three major domains, the focus of indicators of exclusion is on non-monetary aspects. The concept followed by EUROSTAT (and which is used in the context of *InclusiveByDesign*) is that *social exclusion* includes the notion of poverty, but goes beyond it by addressing also types of exclusion that do not result from lack of resources (and therefore can not be considered as poverty).[75] Exclusion from basic social systems such as the labour market, education or the market of goods and services are consequently agreed aspects of social exclusion and addressed in the context of *InclusiveByDesign*.

To gain an understanding of social exclusion, both the excluded individual (or group) as well as the society are under analysis. The indicators used by EUROSTAT to identify the existence of social exclusion and the area of exclusion are complex and require in-depth studies of individuals or of particular target groups. Even under the assumption that the time and budget resources of a project would have been substantial enough to incorporate these studies, the problem of cause-effect identification would occur. *InclusiveByDesign* identified individual

[75] EUROSTAT (1995). Non monetary indicators of poverty and social exclusion : final report. 77 pp. Retrieved 11-05-2002 at http://europa.eu.int/en/comm/eurostat/research/supcom.95/02/result/result02.pdf. P. 21

products / services. From a scientific point of view, it would be desirable to get an answer to the question of the extent to which every identified product / service has had an impact or effect on the social exclusion of individuals or social groups. As the social framework of each individual or group is of a complex nature and as the framework conditions are not controllable (in the scientific sense of the term), an unambiguous conclusion of any cause-effect relation is not possible.

In consequence, the approach taken in *InclusiveByDesign* tried to identify those products / services which have a clear *potential* to support social inclusion or to combat exclusion. Of course, this hypothesis would need verification at some point in time. The Consortium agreed that this verification would be an important aspect to be addressed within a follow-up programme or activity of the Commission.

The potential of the screened products / services was assessed with the criteria described in section 4.1. The aim of the first European-wide survey was to distinguish successful ('good') examples from less successful examples. The selection process and appropriate criteria ensured to a wide extent that the candidates for case studies are developing products and services that successfully address the requirements and needs of a diverse group of potential users.

However, as every survey is based on the assumption that participants report on true facts, these assumptions needed to be verified during the case study visits. Success in the context of this project was defined as a clear potential to contribute to social inclusion or combat social exclusion through the products / services developed by the participating companies. Consequently, examples of good practice need to refer to indicators of social exclusion. Some of the prominent indicators which are of relevance for *InclusiveByDesign* and which were addressed in the case studies were: access to, and level of, education; employment status; access to information, communication and participation; access to training.[76]

The case studies were designed to focus both on the "How?" and the "How successful?" of the identified products and services. This focus is reflected in the interview guidelines (see section 4.2) as well as in the methodology regarding data collection, analysis and validation (see section 4.3).

6.2 Efficiency

In order to continuously monitor the appropriateness of the selected approach, of the invested resources and of the quality of outcomes, project meetings have been used for internal discussions and exchange, as well as to create consensus among participants on the activities of the subsequent project phase. To facilitate high work efficiency, *InclusiveByDesign* has additionally applied certain project management methods, e.g.:

- Precise work plan with milestones

  Distributed work needs synchronization along timelines, which have been discussed and agreed among the project participants. The timetable was used both for structuring and monitoring of project efforts. Within the first year of the project, all participants were able to meet the deadlines and to contribute to the various milestones.

  During the second phase, the efforts for designing, organising performing, and analysing the case studies required more effort than originally expected. Therefore, an extension of the project duration by 3 months was agreed with the European

[76] ibid.

Commission. This additional time enabled necessary and thorough feedback loops, both within the consortium and with the participating organisations.

Table 21: Timetable and milestones (December 2000 - August 2002)

Month [Project month]	Event	Milestones
Dec 2000 [1]		
Jan 2001 [2]		
Feb 2001 [3]	Kick-off meeting; launch of project web site	Indicators and Definitions
Mar 2001 [4]		Questionnaires; Pretest
Apr 2001 [5]		Send out; Reminders; Coding
May 2001 [6]		
Jun 2001 [7]	2nd project meeting (29.-30.06. Florence)	Data analysis
Jul 2001 [8]		Presentation / Documentation
Aug 2001 [9]	Interim report	Case studies
Sep 2001 [10]		
Oct 2001 [11]	Virtual meeting	Internal project evaluation
Nov 2001 [12]		
Dec 2001 [13]	Project progress and evaluation report	
Jan 2002 [14]		
Feb 2002 [15]		
Mar 2002 [16]	3rd project meeting (05.-06.04. Kaiserslautern)	
Apr 2002 [17]	Performance of case studies	Report preparation
May 2002 [18]	Performance of case studies	
Jun 2002 [19]		
Jul 2002 [20]	Review by organisations	
Aug 2002 [21]	Final synthesis, evaluation & project report	Final dissemination

- The project management ensured that milestones were reached in time (through a monitoring mechanism)

  The approach to remind participants in time to submit contributions and to review timetables and the work plan from time to time has proven to be very efficient. Practical work often uncovers problems that have not been foreseen during the write-up of a proposal. Direct communication between the project manager and each single participant helped to resolve these situations easily and quickly.

- Regular project meetings to keep all partners informed about the project's progress

  The timing of project meetings was beneficial for the structuring of work (see section 2) Furthermore, participants were able to synchronise their activities with other projects, due to early agreement on meeting dates and places.

- Provision of a web site with information on the project progress with a 'participants-only' area (see section 6.3)

  Communication between project participants based on e-mail is a standard practice in European projects. Nevertheless, e-mail communication has some limitations, especially when it comes to the transfer of relatively large amounts of data. The provision of a web-based information space for the exchange of huge data files (e.g., statistical evaluation of the surveys, reports, presentation slides) has been proven to be very beneficial, especially for participants with slow internet connections.

- Usage of electronic communication means

  Although being considered as being necessary, a fourth project meeting in the context of *InclusiveByDesign* was replaced by a virtual meeting, due to budget constraints. Experience has shown that the use of electronic communication means (for exchange

of documents, but also for short-term co-ordination tasks and day-to-day communication) is able, to some extent, to minimise the need for (expensive) meetings with the partners throughout Europe, therefore contributing towards the efficient use of time and budget resources.

6.3 Dissemination

A **Web site** was created specifically for the *InclusiveByDesign* project, available at http://ibd.ics.forth.gr. The site, hosted and maintained by FORTH-ICS, has been structured to serve multiple purposes: a) it provides information on the project to any interested party (see Figure 8), b) it has facilitated the carrying out of the surveys (see Figure 9), and c) it has served as a virtual meeting 'point' for project partners, hosting documents and other information internal to the project (see Figure 10). The use of the Internet in comparison to other dissemination and communication media has had several benefits, which contributed to enhance the efficiency of the project:

- The information is accessed by interested visitors
- Costs for printing and distribution were saved
- Interviewees were contacted quickly
- Only the invitation to participate in the survey was sent to interviewees
- The web-based questionnaire (placed on the project's website) made possible anonymous participation in the survey
- Large documents could easily be exchanged via the participants-only area

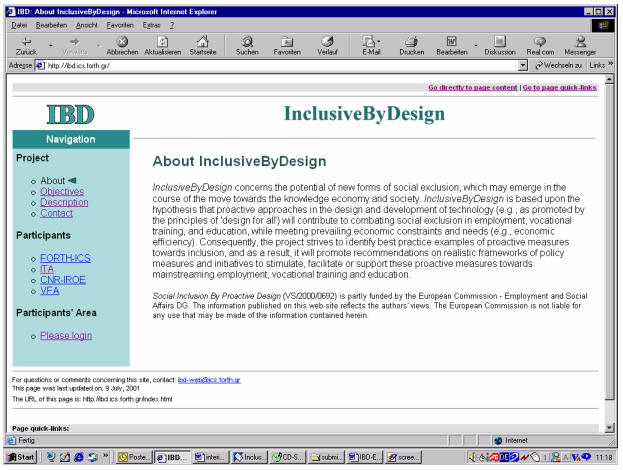

Figure 8: Screen-shot of the *InclusiveByDesign* web site

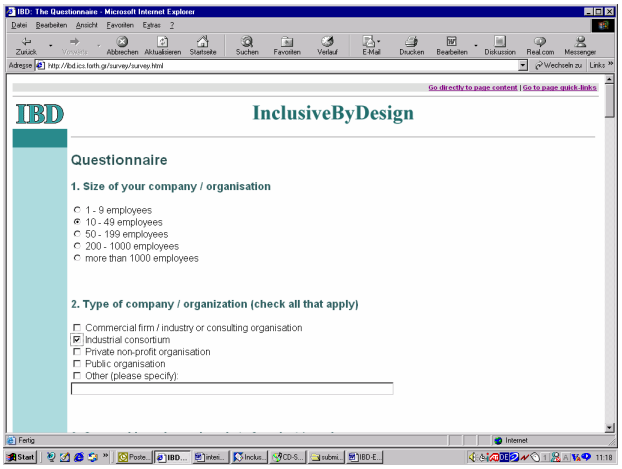

Figure 9: Online questionnaire project phase 1

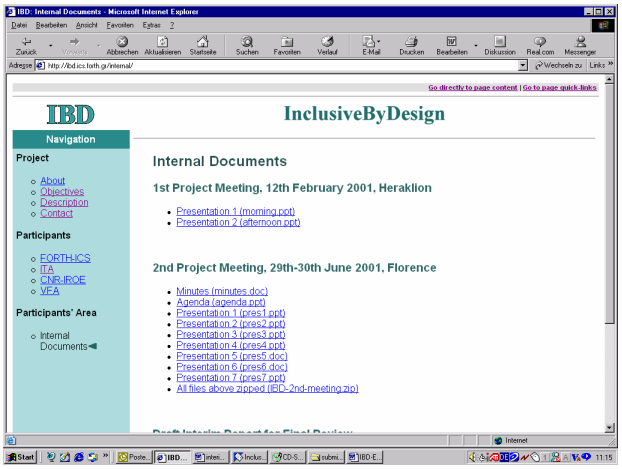

Figure 10: Participants' area

To evaluate the effectiveness of the web site, the log files of http://ibd.ics.forth.gr/ have been analysed to draw further conclusions. Table 22 displays the main outcomes.

The first line in the table documents shows the dates covered by this statistic file. The whole project period from the publishing of the project's web site (February 23, 2001) until the end of the project (August 31, 2002) has been monitored.

The second category reported in the statistics table is focusing on the number of **hits**. A hit in this context is a request to a web server for a file. "Successful Hits" is the total number of files that have been requested from the server by a visitor's web browser, excluding those requests that resulted in an error. Beyond the called HTML page, this number additionally includes all graphics, audio/video files, and other supporting files which are part of the page.

In the following category, the number of **Page Views** is recorded. Page Views is the number of pages viewed, not including the supporting graphic or media files. Pages counted are files with extensions such as ".htm", ".html", ".asp" and others.

The next category is focusing on the number of **client sessions**. These are counted using the visitor's individual IP address, domain name, or cookie. This number reflects more precisely the amount of people that have visited the web site. Independently of how many pages one specific visitor has opened on the *InclusiveByDesign* web site during one session, the counter of the number of visits is incremented only by one. However, the same people might return to the web page several times, e.g., with days or weeks of delay in between. Therefore, the

"Unique Users" variable counts each computer from which the *InclusiveByDesign* web pages have been accessed only once. As computers are sometimes shared by several users, the number of "Unique users" might underestimate the real number of visitors. The following category is focusing on **bandwidth**, which is of interest for selecting appropriate hardware and connections to maintain best service for the visitors. It is clear from the evaluation that the project has not under-estimated the bandwidth requirements, and that the hardware used was appropriate.

The final category of **most active periods** is only of an informative nature, but has no impact on the evaluation.

Table 22: Usage statistics of http://ibd.ics.forth.gr/ (23.02.2001 - 29.11.2001)

Detail		
Date	Database contains	23 Feb 2001 15:00 PM - 31 Aug 2002 15:58 PM
	Date of this report	30 September 2002 15:57 PM (Monday)
	Start date	23 February 2001 00:00 AM (Friday)
	End date	31 August 2002 23:59 PM (Saturday)
	Total number of days	555
Hits	Number of successful hits	7646
	Average hits per day	14
Page Views	Number of successful page views	4630
	Average page views per day	8
Client Sessions	Number of user sessions	1471
	Average Number of user sessions per day	3
	Unique Users	1396
Bandwidth	Data transferred	207.39 MB
	Average Data transferred per day	373.68 KB
Most Active Periods	Most active hour of the day	12pm to 1pm
	Most active day of the week	Wednesday

Figure 11 gives a general overview on bandwidth, client session, page views and hits over the duration of the project. An increase is expected after the final report will have been published much in the same way as a peak of access rates was visible after the publication of the interim report.

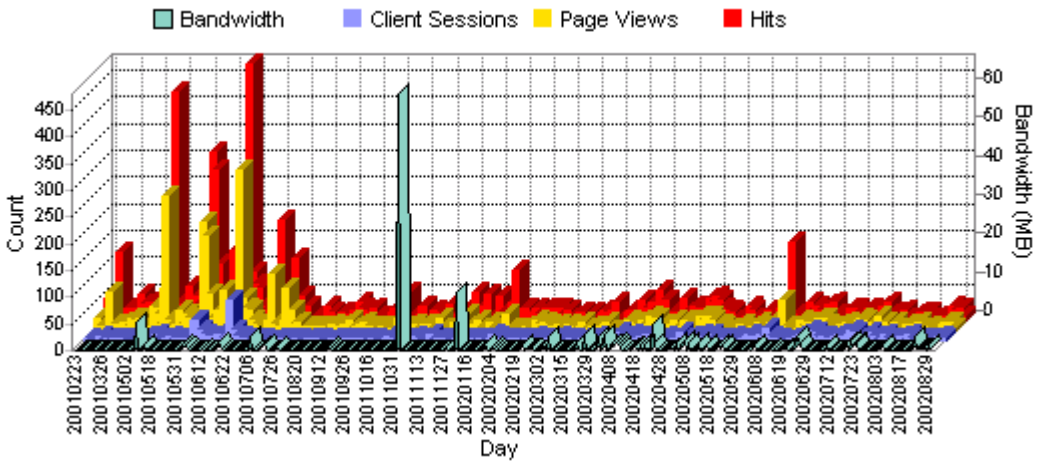

Figure 11: General overview

The interim report of *InclusiveByDesign* has been downloaded 176 times from external visitors, which is a remarkable number, as it can be assumed that only those visitors that are interested in the topic of the project downloaded the document. To some extent, this can be called a self-selection process, as 176 (12 %) of the estimated 1396 unique users have downloaded this file and therefore have classified themselves as the relevant target group for

this report. In this respect, the dissemination strategy of *InclusiveByDesign* has been very successful, as the distribution of its interim (and final) report has been demand- and interest-driven, which is the preferable method in comparison to a wide, but un-filtered distribution.

Annex A: Questionnaire

InclusiveByDesign

Questionnaire

1. Size of your company / organisation

- ☐ 1 - 9 employees
- ☐ 10 - 49 employees
- ☐ 50 - 199 employees
- ☐ 200 - 1000 employees
- ☐ more than 1000 employees

2. Type of company / organization (check all that apply)

- ☐ Commercial firm / industry or consulting organisation
- ☐ Industrial consortium
- ☐ Private non-profit organisation
- ☐ Public organisation
- ☐ Other (please specify):

3. Geographic region and market of product / service

a) Design and development

In which country was your product / service mainly designed and developed?
(Please specify)

b) Market

Please list at most three countries in Europe, where you sell most pieces of your product / mainly offer your service. (Please specify)

4. In which of the following domains is your product / service used? (Check all that apply and explain below, if necessary)

☐ **Education** (e.g., schools, universities, self-teaching, libraries)

Details:

☐ **Vocational Training** (e.g., training centres, training departments in companies, vocational self-teaching)

Details:

☐ **Employment** (e.g., labour offices, recruitment / job web sites)

Details:

☐ Other (please explain):

5. Please briefly describe your product / service and state its main purpose:

6. Was your product / service originally designed for specific target groups?

○ Yes

○ No

If YES:

a) Which were the groups (or group) the product / service was originally designed for? (Check all that apply)

☐ Children

☐ Students

☐ Women

☐ Older people

☐ Unemployed people

☐ People with disabilities

☐ Foreigners / Immigrants with different native languages

☐ Citizens who rarely leave their homes

☐ Others (please specify):

b) If you have indications that the product / service is used by additional groups than those it was originally designed for, check all that apply:

☐ Children
☐ Students
☐ Women
☐ Older people
☐ Unemployed people
☐ People with disabilities
☐ Foreigners / Immigrants with different native languages
☐ Citizens who rarely leave their homes
☐ Others (please specify):

(Continue with question 7)

If NO:

Was your product / service originally designed for the average user?

☐ Yes
☐ No. Please explain:

7. If the needs of diverse groups of citizens are addressed in you product / service, which types of support were used during its design and development phase? (check all that apply)

☐ **Design** tools
☐ **Development** tools
☐ **Assessment / evaluation** tools
☐ **Best practice** collections
☐ **Corporate** guidelines, methodologies and approaches that facilitate

Inclusive Design

☐ **Third-party** guidelines, methodologies and approaches that facilitate Inclusive Design

☐ **Standards** like ISO 9241, ISO 13047 or accessibility norms

☐ **Interdisciplinary teams** in product / service design and development

☐ Others (please specify):

_____

8. Your product / service is to a certain extent capable of … (check all that apply)

☐ … customisation by a **technician / administrator** to accommodate the (interaction) requirements of users (e.g., , adjustments of input devices to user needs, language settings of a service, etc.)

☐ … customisation by the **user** to accommodate the specific (interaction) requirements (e.g., adjustment of button size, selection of topics of interest, keyboard settings)

☐ … **automatic** adaptation to the (interaction) requirements of all users (e.g., automatic adaptation to the user's individual input speed, adjustment of brightness to lighting conditions, presentation of information which is likely to be of importance for the user, etc.)

☐ … neither automatic adaptation nor customisation. The product is **designed** to address the (interaction) requirements of all users without the need for adaptation or customisation.

9. Have you measured the users' satisfaction with the product / service?

☐ Yes. Please specify, how (check all that apply):

- ☐ User satisfaction surveys conducted by our company / organisation
- ☐ User satisfaction surveys conducted by others
- ☐ Statistics on user feedback (e.g., hotline data)
- ☐ Product has received quality / best design awards
- ☐ Other (please specify):

_____

☐ No

10. How would you position your product / service on the market? (check the most appropriate only)

☐ Our product / service is the No 1 with regard to market share

☐ Our product / service belongs to the group of the best selling in its category

☐ Our product / service has a record of a continuously growing market acceptance during the past years

☐ Our product / service has a constant market share

☐ A clear market position has not developed yet (e.g., product / service was introduced recently to the market)

☐ Market data are not available at present

☐ Other (please specify):

11. Have you benchmarked (compared) your product / service with competitors' products / services with regard to ... (check all that apply)

☐ … **effectiveness** (the extent to which the intended user goals are achieved)?

☐ … **efficiency** (the resources that have to be expended to achieve the intended goals)?

☐ … **users' satisfaction** (the extent to which the user finds the use of the product acceptable)?

☐ … **usability** (effectiveness + efficiency + satisfaction)?

☐ … **accessibility** for diverse target groups?

☐ … **ergonomics / human factors**?

☐ … its **usability** for "every" potential user (inclusiveness)?

☐ … other (please specify):

12. Which groups do you actively involve in the process of designing and developing your product / service? (check all that apply)

☐ Current end users

☐ Future / potential end users

☐ User representatives / user advocates

☐ External experts (e.g., usability consultants)

☐ Internal experts (e.g. experienced designers and developers)

☐ Others (please specify):

13. If you involve groups of current or future users in your design and development process (see question 12), how would you characterise the composition of these groups? (check all that apply)

☐ Representative sample of the **diversity** of the target end users

☐ Representative sample of the **average** target end user

☐ Occasional / informal sample of the **diverse** target end users

☐ Occasional / informal sample of the **average** target end user

☐ Small (i.e., non-representative) sample for in-depth feedback / evaluation

☐ Other (please specify):

14. Does your company / organisation additionally contribute to Inclusive Design (as we have defined it in this questionnaire)?

☐ Yes. Please specify: (check all that apply)

☐ Inclusive Design is part of the company's / organisation's policy and / or strategy.
Please provide keywords:

☐ The management commits to Inclusive Design.
Please provide keywords:

☐ The management actively encourages and motivates for Inclusive Design.
Please provide keywords:

☐ Employees are empowered to give input to Inclusive Design.
Please provide keywords:

☐ Employees are trained to apply Inclusive Design.
Please provide keywords:

☐ Employees are rewarded when applying Inclusive Design.
Please provide keywords:

☐ Integration of Inclusive Design into quality management approaches.
Please provide keywords:

☐ Other (please specify):

☐ No

15. Please indicate which of the following policy types or other factors were supportive for your company / organisation in designing and developing this product / service in an "inclusive" way: (check all that apply)

☐ **European** directives, regulations or recommendations
☐ **National** legislation or regulations
☐ **Regional** policy measures
☐ **Corporate** policies of parent companies
☐ **Procurement** policies of your (corporate) customers
☐ Existence of **national** standards
☐ Existence of **international** standards
☐ External **financial support / co-financing**
☐ Input by **user representatives / user organisations**
☐ **Networking / co-operating** with research organisations
☐ Other (please specify):

Participation in follow-up case studies

Thank you very much for taking the time to fill in the questionnaire. The information you have provided will be kept strictly confidential. As this survey is also a preparation of follow-up case studies ('good practice collection in Europe'), we would like to ask you about your company's / organisation's willingness to participate in such a case study, scheduled towards the end of this year. Please check one of the options in the statement below, and, if your company / organisation wants to co-operate with us in a case study, provide us with your contact details.

Statement

If our company / organisation is selected as a candidate for the collection of good practice approaches in Inclusive Design, we

☐ would like

☐ would not like

to participate in a follow-up case study (please check one answer). Please contact the following person to arrange the details for this case study:

Name:

Name of company / organisation:

Address:

Phone:

Fax:

E-Mail:

Send Questionnaire

For questions or comments concerning this site, contact: ibd-web@ics.forth.gr
This page was last updated on: 13 June, 2001
The URL of this page is: http://ibd.ics.forth.gr/survey/survey.html

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ANNEX B: InclusiveByDesign Case Studies: Interview guidelines

PART 1: BUSINESS PERSPECTIVE

This section contains the structure of interview guidelines, as created for the interview sessions that were performed during Phase II from the business perspective.

Interview session A: Product description and user groups

0 Data reg. interviewee(s), interview

0.1 Interviewee(s)

0.2 Interview

1 Product / Service (general information)

1.1 Purpose, description of product / service

1.2 Target market

1.2.1 Typical customers (branch/sector) and/or users

1.2.2 Number of customers (not users!)

1.2.3 Geographic region

1.2.4 Available languages

2 Economical aspects

2.1 Turnover (of the product)

2.2 Market position of the product/service

2.3 Project budget / Cost efficiency

3 User diversity

3.1 Target users

Please note: This section refers to the target user group, i.e., the user group, the product / service was designed for. The actual user group may differ from this target group and is treated in section 3.2.

3.2 Actual users

Interview session B: Users' satisfaction and usability, and accessibility

4 Data reg. interviewee(s), interview

4.1 Interviewee(s)

4.1.1 position, job title

4.1.2 experience with the products/processes (e.g. in years)

4.2 interview

5 Users' Satisfaction

5.1 surveys by own company

5.1.1 characterization of the method

5.1.2 user satisfaction results

5.2 surveys by others

5.2.1 characterization of the method

5.2.2 user satisfaction results

5.3 statistics on user feedback, eg. hotline-data

5.3.1 characterization of the method

5.3.2 user satisfaction results

5.4 quality / best design awards

5.4.1 characterization of this award

5.4.2 specific reasons for awarding your product

6 Benchmarking reg. usability / ergonomics / human factors

6.1 Definition of usability / ergonomics / human factors

6.2 characterization of the benchmarking method

6.2.1 Focus

6.2.2 Type of benchmarking

6.2.3 Detailed description

6.3 Benchmarking results

7 Benchmarking reg. accessibility / usability for all

7.1 Definition of . accessibility / usability for all

7.2 characterization of the benchmarking method

7.2.1 Focus

7.2.2 Type of benchmarking

7.2.3 Detailed description

7.3 Benchmarking results

Interview session C: User involvement

8 Data reg. interviewee(s), interview

8.1 Interviewee(s)

8.2 interview

9 Description of user involvement

9.1 Development stage

9.2 *Goals / outputs*

9.3 Method

9.3.1 Description of method

9.3.2 *„continuity“:*

9.3.3 *degree of participation*

9.3.4 Problems reg methods

9.3.4.1 Problems/challenges/limitations

9.3.4.2 Solution approaches

9.4 Sample

9.4.1 Sample size

9.4.2 Types of participants

9.4.3 Composition of sample

9.4.4 location

9.5 „Tools“

9.5.1 Description

9.5.2 Problems: reg tools

9.5.2.1 Problems/challenges/limitations

9.5.2.2 Solution approaches

10 Organizational aspects

10.1 *Experience of the organisation reg. this type of user involvement*

10.2 Partnerships

10.2.1 Description

10.2.2 Problems reg. Partnerships

10.2.2.1 Problems/challenges/limitations

10.2.2.2 Solution approaches

10.3 Internal actors (employees)

10.3.1 Description

10.3.1.1 Responsibilities

10.3.1.2 specific qualification/training?

Interview session D: Organizational issues

12 Data reg. interviewee(s), interview

12.1 Interviewee(s)

12.2 interview

13 Organizational Support

13.1 Type of organization

13.2 Experience of the organisation

13.3 Policy, strategy, commitment

13.4 Employees

13.5 Integration into quality / process management approaches

13.6 Partnerships

14 Economical aspects

14.1 Turnover / profit of the company / organization

14.2 Project budget / Cost efficiency (see A)

PART 2: TECHNOLOGY PERSPECTIVE

Diversity of users / platforms / usage contexts

Section A. Diversity Of Users / Platforms / Usage Contexts

Please provide us with a brief description of your product /service.

A.1 In Information Society Technologies, inclusive design has broad connotations referring to a conscious and systematic effort towards building interactive systems and services, accessible by anyone, anywhere and at anytime. What are the accessibility challenges relevant to the products and services you develop?

- Variety of target user groups
- Variety of interaction technologies being used
- Variety in contexts of use
- Other, please specify ……..

A.2 Does your product development process aim to address diverse user groups?

If yes, please answer the following questions:

A.3 Which user groups are addressed by the product? (please enumerate briefly)

A.4 Which key feature(s) of the product can provide evidence for addressing diverse user groups?

A.5 Does your product development process aim to address multiple technology platforms, in terms of either hardware or software (e.g., personal computer, mobile phone, PDAs, Java VM, etc.)?

If yes, please answer the following questions:

A.6 Which technology platforms are addressed by the product?

A.7 Which key feature(s) of the product can provide evidence for addressing multiple technology platforms?

A.8 Does your product development process aim to address different contexts of use (e.g. learners in the workplace, at a public kiosk, in the classroom, at home, on the move, etc.)?

If yes, please answer the following questions:

A.9 Which contexts of use are addressed by the product? (please describe briefly)

A.10 Which characteristic features of the product can provide evidence for addressing different contexts of use?

A.11 (a) Does your product (or different versions of it) concentrate on any of the above dimensions of inclusive design?

(b) If yes, please explain. Which dimension(s) is /are in focus and why?

Product development lifecycle: phases and corresponding practices

Section B. Narrative Description of Phases

Please give us a brief narrative account of the process involved in your product's development lifecycle, starting from its concept creation phase and including requirements gathering, design and implementation phases, testing and evaluation, and finally introduction of product to market.

1a. Concept creation phase

1b. Requirements gathering phase

2a. Design phase

2b. Implementation phase

3. Testing / Evaluation phase

4. Phase of product introduction to market

Section C: Checklists of Used Practices

At this point, you are kindly requested to direct your attention to the following lists of practices representing processes, methods, techniques and tools, potentially usable during a product's development lifecycle.

Please go through the items of the lists and, for every item that you recognise as a practice actually used during the development of your product, give us a short explanation mentioning:

a) which specific phases of the process it was applied to (see phases below, with their codes), and

b) whether it was applied with respect to specific user groups, technology platforms or usage contexts

1a. Concept creation phase *2a. Design phase* *3. Testing / Evaluation phase*

1b. Requirements phase *2b. Implementation phase* *4. Marketing phase*

a. Practices applicable to all phases

P1 Directly involve end-users

P2 Involve user organisations

P3 Check implications of available technologies on final product's accessibility

P4 Check implications of different platforms on final product's accessibility

P5 Check implications of different usage contexts on final product's accessibility

b. Methods for acquiring know-how

P6 Review relevant literature

P7 Use expert consultation

P8 Acquire expertise from R&D organizations

P9 Involve professionals (who know the users' requirements)

P10 Outsource to expert groups

P11 Review and examine case studies

P12 Review and examine similar products

P13 Examine available technology (including assistive technology)

P14 Hire personnel expert in Inclusive Design concepts and practices

P15 Train existing personnel in Inclusive Design concepts and practices

P16 Comply with recommendations / standards

P17 Comply with regulations

P18 Follow usability guidelines

P19 Follow accessibility guidelines

P20 Adopt quality control processes (e.g. ISO 9002, ISO 1437)

P21 Maintain external subcontracts

c. Empirical data collection methods

P22 Directly involve end-users

P23 Involve user organisations

P24 Carry out interviews

P25 Carry out observations

P26 Carry out surveys

P27 Test prototypes

P28 Test against requirements

P29 Perform expert evaluation

P30 Perform user-based evaluation

P31 Perform field trials

P32 Collect user opinion

P33 Collect user complaints

d. Concept creation / Design / Implementation methods

P34 Enumerate design alternatives

P35 Conceive / Design / Develop product based on mainstream technology

P36 Conceive / Design / Develop product based on in-home custom-made technology

P37 Adopt specific design methods

P38 Adopt specific architectures

P39 Adopt open or modular architectures

P40 Support modular design

P41 Support interoperability between implementation modules

P42 Adopt iterative design processes

P43 Support adaptivity

P44 Support adaptability

P45 Adopt specific development methods

P46 Support different development lines for each platform

e. Product marketing methods

P47 Establish alternative marketing channels

P48 Establish different marketing channels for different user categories

P49 Establish different marketing channels for different platforms

P50 Establish different marketing channels for different usage contexts

f. Tools

T1 Use questionnaires

T2 Use requirements collection tools

T3 Use design aids environments

T4 Use prototyping tools

T5 Use special design tools

T6 Use special implementation tools

T7 Use special toolkits

T8 Use compliance testing tools

T9 Use performance measurement tools

T10 Use usability evaluation tools

T11 Use accessibility evaluation tools

Section D: Checklists of Barriers / Difficulties

In this section you are kindly requested to go through the following lists of challenges regarding the application of Inclusive Design practices. For those items that are applicable to your product-related experience, briefly discuss challenges encountered with regard to specific phases of the process (as previously), as well as with reference to user groups, technology platforms, and usage contexts.

a. End users

D1 - the company does not follow user-centered approaches in the product development process

D2 - the involvement of end-users is too costly and time consuming

D3 - it is very difficult to find end-users when designing for diverse user groups

b. Structure and organization of the company

D4 - the company is so large and diverse that a change to adopt inclusive design would be too complicated

D5 - the company is so small that a change to adopt inclusive design is beyond its resources

D6 - the nature of the development process followed in the company makes it difficult to adopt inclusive design principles and practices

D7 - it is very difficult to introduce new practices in the different departments of the company

D8 - the communication and cooperation between the various departments of the company will become more difficult if we introduce inclusive design

c. Material on inclusive design

D9 - lack of literature on inclusive design

D10 - lack of case studies / best practice collections on inclusive design

D11 - lack of guidelines on how to practice inclusive design

D12 - lack of design methods to support inclusive design

D13 - lack of techniques to support inclusive design

D14 - lack of tools to support inclusive design

d. Awareness / training on inclusive design

D15 - lack of knowledge within the company on practicing inclusive design

D16 - lack of time of personnel to be trained on inclusive design

D17 - training on inclusive design is too costly

e. Concerns about inclusive design

D18 - the adoption of inclusive design will make the company an assistive technology firm

D19 - the adoption of inclusive design will narrow the customer base

D20 - the adoption of inclusive design will imply costly changes in our development process

D21 - the adoption of inclusive design will slow down the design-to-market time

D22 - inclusive design is simply design for disability and represents a niche market

PART 3: POLICY PERSPECTIVE

Policy implications

1. To what extent , you think the strategy of the company to produce well designed products that are inclusive is encouraged /affected by a stimulating European or national or local policy ?
2. What exactly have been the stimulating policies which made this company create well designed products that are inclusive?
3. By what type of stimulus was the effect achieved: economic incentive, image, "penalties" if they do not follow inclusive design principles, etc
4. Are you aware of policies in other regions or countries that have a better impact on companies strategies to develop well designed products that are inclusive?
5. Do you think that legislation issued at different levels (European, national, regional) has different effect on stimulating companies to develop products or services in an inclusive way? If yes, which level has a better effect?
6. Do you think that a combination of legislation issued at all the three levels would create a new trend and the impact for companies to develop products or services in an inclusive way would be more effective? Please indicate which of the following types of policy could have a better effect on stimulating the company to produce products or services in an inclusive way (Tick all that apply)

· European directives
· European recommendations
· European programmes/action plans (eg eEurope)
· European guidelines
· National legislation
· National action plan
· National guidelines
· Regional policy measures

7. Would you like Europe/Your country/ Your Local Authority:

· Recognising the access to ICT as a right of any person (thus compelling industries to produce Inclusive products)
· Establishing guidelines and standards,
· stimulating industries
· (free of charge services ;
· a sort of IBD label, like the Swedish TCO, for instance;
· inclusion within the ethic certification;
· code of practice)
· admitting just IBD products to be sold within their own countries,

· deciding that information technologies and information services funded or procured by Public Authorities must be accessible.

8. Would your company strategy change in favour of developing products or services that are inclusive if there were increased demands from informed customers?

Have different target groups such as users associations contacted the company in order to inform you about the potential customers and stimulate the company to develop products that are inclusive? If yes, has the strategy of the company been affected?

Annex C: Case Descriptions

TABLE OF CONTENTS

1 Case Description *MAFRAU S.r.l.*

1.1 The company *MAFRAU* S.r.l.

The company was founded in 1989 with the name "O.F. - Orientamento e Formazione (Guidance and training)", in 1995 it altered to "*Mafrau* S.r.l.". Currently, 50 employees are working for the company. The main business areas are 1) computer-based education and training (e-learning), 2) multimedia applications 3) security systems, and 4) information and communication technology in general.

In 2001, the company's turnover amounted to approx. 4 million EUR, approx. 50 % of this amount stem from the e-learning area, which is of particular interest for the InclusiveByDesign project.

1.2 Business area *e-learning*

In 1997, *MAFRAU* started to develop e-learning products. Meanwhile, approx. 30 training courses are offered. Some courses are complemented by traditional on-site training. The underlying didactical approach is called *Must© (Modelli di Universi Simulati e Tutoriali = Tutorial and Simulated Universes Models)*.

Currently, *MAFRAU* co-operates with 10 customer organizations, e.g., universities, vocational training centres, training departments in companies of different size, and public administrations. The company mainly offers online tutorials on people-oriented business processes, as well as interactive, game-like 3D simulations, training the user on decision-making in a context of collaborating with co-workers (management skills). In addition to that, ECDL[1] courses are developed and directly delivered to single end-users.

MAFRAU concentrates its efforts on the Italian market (including South Italy). Thus, with one exception, the products are available in Italian language. The company is an training agency acknowledged by the Italian ministry of public education, research and university. Furthermore, in the field of managers' training, it was the "global supplier" of e-learning products for very large enterprises like Enel or Telecom Italia in 1998-99.

1.3 Striving for usable, e-learning products

MAFRAU invests various efforts in achieving usable e-learning products . Within a specific project, resources for requirements gathering and quality assurance typically range in between 4 and 12 % of the project budget.

1.3.1 User satisfaction surveys

In order to measure and improve the end-users' satisfaction, *MAFRAU* developed several questionnaires. One specific member of the quality assurance department is primarily responsible for this task. User surveys shall be exemplified by a project in which headmasters were trained at home (via distance learning, both, in Italy and abroad) as well as in physical classrooms. The overall training objective was to enable the headmasters to cope with the ongoing structural change of the public school system.

[1] European Computer Driving Licence (ECDL), http://www.ecdl.com

The end-users were surveyed at different stages of the project:

- At the beginning of the training course, e.g. information regarding computer experience, navigation and Internet skills, expectations and motivation were requested.
- At the end of each training module, the users assessed this module, e.g., regarding the achievement of their individual objectives. The results were considered during the development of the following modules.
- At the end of the entire training course, the users were requested to rate, e.g., the usability of the features for electronic communication (esp. e-mail and mailing lists).
- A separate training module on the topic of self-learning was evaluated with regard to learning pleasure, comprehension, and usability issues.

The survey results were used for internal improvements and additionally provided for external evaluators. This external evaluation, which was required by the customer organization, included complementary surveys and observations, and resulted in a top ranking of *MAFRAU*'s product (out of 10 competitors).

1.3.2 Benchmarking

One company representative participates in a working group on "Quality in e-learning" which is organized by a governmental research institute for vocational training.[2]. Current efforts are invested in the development of a benchmarking procedure which includes several dimensions:

- quality of learning content
- learning methodology
- learning technologies
- quality of use (usability)

The latter dimension refers to certain issues like, aesthetics or readability as well as navigational support, online-help and documentation.

1.3.3 Organizational aspects

The approaches outlined in sections 1.3.1 and 1.3.2 are supported by *MAFRAU*'s quality management system which emphasizes a strong customer-orientation and was certified to fulfil the requirements of ISO 9001 in 2001.

1.4 User groups

The target user group, i.e., the user group *MAFRAU*'s e-learning products are designed for, covers users from the age of 18 to 65 years, and comprises students, employees, and unemployed users.

1.5 Diversity of users, technology platforms and usage contexts

MAFRAU's products depend on the expressiveness of graphics for the particular content used in its training for management skills, as the motivational aspects of the user's "immersion" in the represented situation are absolutely key to the success of the particular type of training products. Key features of the product that provide evidence for addressing diverse user groups are the usage of non-technical language, as well as the attention-captivating product format for people of all ages.

[2] Istituto per lo Sviluppo della Formazione dei Lavoratori (ISFOL), http://www.isfol.it

The focus of the company's products is multimedia. The technology platforms addressed by the product development process are large-company intranets and personal computer (browser: Internet Explorer). Products are also available on CD-ROM.

The main context of use can be classified as a type of vocational or extended work-related training, performed mainly at the workplace. In the sense of multimedia as being learning environments which address the user from a multi-modal (i.e., employing different types of sensory inputs) perspective, the instructional approach is quite comprehensive, or inclusive, because of its powerful context-evoking format.

1.6 Product lifecycle: inclusive design practices

Methods used for acquiring know-how: As a method of acquiring know-how, case studies are examined and similar products are reviewed during the concept creation and design phases. Instructional design experts exist within the company, who collaborate very closely with the company's graphics design experts to produce instructional content that maximises the student's "immersion" in the context represented each.

The company is aware of the existence of industry standards, such as the AICC[3], SCORM[4], IMS[5] as well as of the government-issued standards for Italy, and considers those as most relevant to the requirements gathering and implementation phases. *MAFRAU* is also aware of standard usability guidelines, which are followed in the testing / evaluation phase (see section 1.3.1).

The company is occasionally outsourcing to development experts (implementation phase).

Implications of technologies and usage contexts for product lifecycle: the company systematically examines the implications of available technologies on final product accessibility, especially of languages like XML.

Design and implementation: At the beginning of the process, two or three alternatives (design mock-ups) are proposed for review to the client. Specific architectures are adopted as de facto standards. Specific development methods are also adopted, for standard platforms (using Windows-based tools). Iterative design is used, as prototypes are tested by users within the company and offer feedback for redesign.

Testing and evaluation: Prototype testing is done within the company, with employees taking the role of end users. Also beta testing of product versions occurs when those first reach the market. Another method used is collecting user opinions about the company's products, via questionnaires and interviews with user representatives (see section 1.3.1).

Introduction to market: Information collected through the marketing phase is used as feedback for subsequent design phases. Clients (large companies) are critical for shaping the product, because they act as end user representatives in the process of user requirement specification. For that reason, direct contact with the market through beta testing of developed products is probably the most important turning point in generating product redesign specifications.

1.7 Policy issues

The strategy of the company to produce well designed products and services is not positively affected by policies at European and national level.

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[3] www.aicc.org

[4] ADLnet, http://www.adlnet.org

[5] IMS Global Learning Consortium, http://www.imsproject.org

2 Case Description Learn Net Advisors & Research

2.1 The company Learn Net Advisors & Research

The company, *Learn Net Advisors & Research*, was established in 1998, and is located in Birmingham / UK. It "provides needs led, project support through expertise in the development and design of remote teaching and learning methodologies, information management, health and social care, and communications."[6] *Learn Net* consists of two lead partners, who are supported by a network of associates. Since the company offers services which are especially led by the needs of disadvantaged groups, the concept of *inclusive design* is an essential part of the *Learn Net*'s policy and strategy.

2.2 The Virtual classroom (VC)

Within the InclusiveByDesign project, *Learn Net*'s *Virtual Classroom (VC)* is of particular interest. *VC* is a learning environment for collaborative learning in a range of sectors. It is based on a third-party product which was originally developed for academic education and has been further developed and adapted by the company to suit a variety of user groups and usage contexts. Additionally to the product itself, *Learn Net* offers accompanying services, e.g. providing train-the-trainer courses or tutoring. 60% of the above mentioned company's turnover can be traced to activities relating to the *VC*.

Typical customers are colleges of further education, schools, local education authorities, and National Health Service (NHS) Trusts[7], all of them located in the Birmingham area. In several cases, the co-operation took place in the framework of EU co-funded projects, e.g., the *JOB* project which aimed at vocational guidance for people with physical and mental disabilities.[8]

A clear market position of *VC* has not been developed yet. Within the Birmingham area, *VC* is supposed to be widely known as "well tested". Moreover, due to the unique character of *VC*, there were no direct competitors.

2.3 Striving for a usable, inclusive *VC*

Learn Net invests various efforts in achieving a usable, inclusive *VC*. Gathering the users' needs and requirements as well as evaluation is an integral part of all projects, and therefore is considered throughout the planning and management.

2.3.1 Gathering the users' needs and requirements

Learn Net believes in the necessity that requirements gathering needs to take place in personal communication with the future users. For example, in the JOB project tutors trained in requirements gathering as well as in interview techniques perform home visits to select suitable participants. These tutors make use of guiding questions and follow a strict code of practice. In case of applicants with disabilities, accessibility knowledge needs to be bought into the project. Following the requirements gathering, an induction phase takes place, consisting of a training phase and an (optional) get-together of the participants.

2.3.2 Evaluation

The approaches to gather user feedback vary from project to project. In the above mentioned JOB project, an external partner (Tavistock Institute, London) was responsible for the evaluation, whereas

[6] Learn Net Advisors & Research - Who are we?, http://www.learn-net.co.uk/who.htm

[7] The NHS, http://www.nhs.uk/

[8] The JOB Project, http://www.learn-net.co.uk/JOB.htm

in other projects, the evaluation is planned and performed in collaboration with the customers' organizations.

Usually, feedback is requested by all users, using a combination of different methods. Apart from interviews and questionnaires, focus groups ranging from 6 to 15 learners are established at the customer organizations' facilities in order to gather user feedback. To accommodate the diversity of the user groups (e.g., users with restricted motor capabilities or emotional challenges), these rather "traditional" approaches are combined with online evaluations. These mainly take place within separate, "private rooms" of the *VC* which are not accessible by the teachers / trainers. Complementary, evaluation topics are discussed by trainers and learners within the "public room".

The collected feedback is discussed within the project management group in order to improve the current *VC*. Measures being derived during these meetings are communicated to the user groups. Positive user comments are used on the company's web site for promotional purposes.

In addition to the collection of direct user feedback, *Learn Net* tries to retrieve indirect indicators for users' satisfaction, through usage patterns and drop-out rates.

Usage patterns are constructed by tracking:

- the number and type of documents being read (respectively "rooms" visited) by the learners
- the number and type of documents being created by the learners
- the distribution of usage time (e.g., during school time, after school time, during the weekend)
- the number of accesses per learner per week

Drop-out rates (respectively the rate of successful completion of a learning course) are also seen as indicators for the user satisfaction regarding product and support.

2.3.3 Quality Standards

During the further development or tailoring of *VC*, various quality standards are considered.

Certain customers, esp. colleges of further education and local education authorities, require the compliance with own, organization-specific standards. In the context of EU-funded projects, standards being agreed upon within the transnational project consortia play a complementary role.

Moreover, *Learn Net* considers two further standards, both on national and European level: On national level, this refers to the *Becta*[9] standards which were prepared in the framework of a UK Government initiative,[10] comprising technological, didactical and certain usability issues.[11] On European level, the outcomes of the CEN/ISSS Workshop on Learning Technologies (WS/LT)[12] are of relevance for *Learn Net*. Apart from technological, legal, and quality assurance issues, the respective report includes sections on multilinguality and multiculturality as well as on accessibility.[13]

For *Learn Net*, accessibility of *VC* specifically means:

- enabling the users to communicate without requiring a high level of literacy,
- enabling the users to communicate without time pressure,

[9] BECTA, http://www.becta.org.uk

[10] National Grid for Learning (NGfL), http://www.ngfl.gov.uk

[11] Connecting Schools Networking People 2000, http://vtc.ngfl.gov.uk/uploads/text/csnp_complete-29674.pdf

[12] Learning Technologies Workshop, http://www.cenorm.be/isss/Workshop/lt

[13] CEN - A Standardization Work Programme for "Learning and Training Technologies & Educational Multimedia Software", http://www.cenorm.be/isss/cwa_download_area/cwa14040.pdf

- enabling the users to access to VC with any Internet-connected computer, and
- economic affordability

2.3.4 Benchmarking, Awards

Learn Net invests various efforts to improve *VC* by comparing it to other products.

On the one hand, this is performed by the company itself, using existing product databases[14]. These benchmarks are rather feature-oriented and resulted, e.g., in the optimisation of the navigation concept.

On the other hand, *Learn Net* regularly applies for awards, i.e., the benchmarking is performed by third-party organizations:

- One project, dedicated to young users,[15] was submitted to the eSchola 2001 award.[16] Inter alia, the award criteria cover issues like
  - accessibility,
  - ease of use, and
  - appropriateness of content structure and language.[17]

The project was ranked in the top 100 (out of almost 1000 submissions).

- Another project, dedicated to the integration of pupils with and without learning disabilities,[18] was recently submitted for the Birmingham life-long learning award and ranked in the top 6
- The co-operation with a college of further education[19] was acknowledged by the BT Beacon Award for distance learning[20] in 1999.

Furthermore, on regional level, the company collaborates within the *Birmingham ICT Learning Network*, "an informal grouping of practitioners in the West Midlands committed to exploring and disseminating best practice in the design and delivery of on-line learning".[21]

2.4 Target user group

In total, more than 550 adult users successfully finished accredited learning programs delivered via the *VC*. Furthermore, approx. 120 children have used *VC* in various school types.

The target user groups, i.e., the user group, *VC* has been tailored for in various projects, covers several dimensions:

- The age of the target groups ranges between 6 and 75 years.
- Regarding gender, no explicit distinction was made during design.
- The target groups comprise

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[14] provided, e.g., by BECTA, http://www.becta.org.uk

[15] Moor Green Web Designers, http://www.learn-net.co.uk/moorgreenjnr.htm

[16] eSchola 2002, http://www.eun.org/eun.org2/eun/en/index_eschola2002.cfm

[17] eSchola 2002 - Criteria, http://www.eun.org/eun.org2/eun/en/EUN_eLearningAwards/sub_area.cfm?sa=1726

[18] The All_In project, http://www.apectelwg.org/apecdata/telwg/23tel/dcsg/dcsg_20.htm

[19] Bournville College of Further Education, http://www.bournville.ac.uk

[20] AoC - Beacon Awards, http://www.aoc.co.uk/beacon/index.php

[21] ICT Learning Network, http://www.ictlearningnetwork.bham.org.uk

  - young pupils across all sectors and abilities from the gifted and talented to pupils in special schools (in one specific project, pupils with and without learning disabilities were integrated within one common *virtual classroom*)
  - children who are disconnected from the traditional educational system, e.g., during an extended leave with their parents
  - students
  - employees, e.g.,
    - users with busy life styles who have excluded themselves from the traditional educational system
    - users with limited primary education
  - unemployed adults
  - citizens who rarely leave their homes, esp.,
    - users with physical disabilities (e.g. restricted mobility)
    - users with psychological problems (e.g., agoraphobia)
  - ethnic minorities with different native languages (however, those "community languages" being relevant in the Birmingham area have not been addressed so far in the VC due to, for example, the problems of reading or writing those community languages)
- The attitude to computer usage widely varies which may be indicated by very different drop-out rates, from nearly 0 % (esp. children) to 30 % (esp. adults).
- The target groups include both, voluntary users (mainly learners) as well as persons being obliged to use VC (mainly teachers or trainers).
- No prior familiarity with using computers is required. Approx. 80% never used a computer before working with VC.
- The target groups additionally comprise
  - users with significantly restricted auditory capabilities,
  - users with cognitive or psychological problems,
  - users with a wide range of literacy levels, including users with very poor literacy skills.

2.5 Diversity of users, technology platforms and usage contexts

The key features of the product that provide evidence of potential to address diverse user groups are:

1. The asynchronous nature of access to coursework, which allows equal opportunity for participation to learning, regardless of the time needed to perform relevant tasks.
2. The lowest common denominator regarding technological complexity / access requirements; working in tandem with organisations (e.g. within the project ENABLE), to provide specific interaction techniques to different user groups.
3. The existence of adaptability/design features, though only for the trained professional.

The Virtual Classroom is an asynchronous system for distance learning. The product does not offer ready instructional content, but tools are available for teachers / trainers to develop educational materials. Customers get packaged charges for consultation and decision-making, design and development, set up of virtual classroom, set up of virtual social area, virtual library, virtual evaluation room.

The technology platform addressed by the product is the web (Internet-driven product), and the hardware required is a desktop / laptop PC plus modem. This platform's initial version was based on Lotus Notes client, and the recent version is available over the World Wide Web.

The usage contexts supported by the product are the following:

a. Learners at home, such as users who cannot leave home, or learners who cannot communicate easily for various reasons, or people who cannot easily cope with the socio-emotional requirements of co-operative learning in small groups (for instance, a person with agoraphobia). In fact, anybody can become a Virtual Tutor and teach others through the Learn Net platform, provided that they have passed the testing process successfully.

b. People on the move; for instance, members of a ballet company have been exploring using the Virtual Classroom to complement their general education, since, as a result of their career / lifestyle, their academic achievements have been neglected.

c. Online web users: the platform is used in South Birmingham to link to UK online centres based in the community,[22] through an e-Government initiative for disadvantaged communities[17]. This is a collaborative venture where local people can access e-learning and local people can be trained as people virtual mentors and tutors mentors.

d. Students in schools: educational use of the platform takes place in schools through a Special Education program (e.g., All In project; Virtual Inclusion)

The software can be adapted for accommodating different contexts of use, by professionals (not by the end-user). The overall emphasis of Learn Net is to accommodate the learning needs of various types of users operating in several different types of contexts.

2.6 Product lifecycle: inclusive design practices

Concept creation & requirements gathering: The initial idea of the Learn Net platform originated in the context of involvement in European consortia and HORIZON[23] – funded work. Within-consortium expertise, as well as input from end users contributed to the gathering of requirements. Additional expertise was sought from Advice & Guidance programs, as well as in the results of official reports of external evaluators regarding the earlier projects.

Design and implementation: Learn Net adopts specific design methods and specific architectures in the context of inclusive design. Learn Net's Virtual Classroom platform was originally designed for university students, and later was redesigned for individuals with disabilities. End users (tutors and students) were involved in the evaluation of the initial version. In order to capture evolving user requirements, with each new e-learning program users are asked to fill an evaluation form before and after their educational involvement (see section 2.3.1 - 2.3.2).

Testing and evaluation: Product evaluation is carried out mainly by involving end users, not by experts (see section 2.3.2).. Ongoing evaluation of the product is practiced by Learn Net, as every student that exits the e-learning programme is asked to fill-in a questionnaire. A lot of such information has been gathered through the Virtual Tutors programme[24].

Introduction to market: Key people are assigned to introduce the product and pilot programs are used to introduce the product to different user groups. Publicity is given to the product in the context of dedicated events (Learning City Conference, Birmingham 2000). Learn Net establishes different marketing channels for different user categories and for different usage contexts.

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[22] Net-Bourn College, http://www.net-bourn.org

[23] The EMPLOYMENT initiative, http://www.employment.ecotec.co.uk/index2.htm

[24] http://as1.ipfw.edu/2000tohe/papers/garner3.htm

End user involvement: The overall empirical evaluation methodology used is that of 'action research' (i.e., pragmatic-oriented evaluation, with actual - not sampled - end users, during actual learning situations). The end users have been involved at every stage and continue to impact on the developments through action research. Where Learn Net are managing programmes (and no programmes are managed externally – although they may be delivered by other organizations) it is easy to collect user comments and to make adjustments during the lifespan of the programme.

Methods used for acquiring know-how: Relevant literature is reviewed, as well as case studies. Professionals are involved on user requirements for consultation. Similar products are reviewed and examined, and also available technologies (see section 2.3.4), including assistive technologies (software supporting inclusion such as screen readers for partially sighted learners).

Empirical data collection methods: In the context of user-based evaluation, Learn Net carries out interviews, observations, prototype testing and testing against requirements, field trials, and collects user opinion and user complaints.

Accessibility: Virtual Classroom is Bobby compliant[25]. However, the RNIB[26] guidelines have not been fully adopted yet, because of problems related to the non-visual presentation of discussion threads. Accessible terminals are usually available in the client institutions.

Instructional design and evaluation: Some interesting evaluation results have been obtained through evaluation sessions with users: there is a certain threshold regarding connected users, below which the usefulness (of the online classroom) is limited and a corresponding upper threshold, which, if exceeded, usefulness is again undermined (optimal participation is between 10 and 15 users). Another insight gained from evaluation sessions concerns how ways of recruitment impact on motivation, and drop-out rates as a consequence. Users must be prepared before actual exposure to the product, to become familiar with what is required from them, i.e., they must learn to participate frequently and offer input.

2.7 Policy Issues

The strategy of the company to produce well designed products and services that are inclusive is affected by different policies at European and national level.

Learn Net is involved in many European and national projects.

In all the European projects the according guidelines and standards for the design of the final products are considered (see section 2.3.3). Products are designed in a way to meet the needs of different end users including disabled people.

At national level, the strategy of the company is influenced by the e-Government Initiative with the objective that all public services in the UK shall be online by 2005. *Learn Net* has been commissioned to build a virtual college for delivery to 5 UK online centres at local level. It is planned to make the service accessible to all users including disabled users.

The company considers important the exchange of experience and transfer of know how with other European countries that have national inclusion policies (e.g. Italy, Spain)

Learn Net strongly believes that a combination of legislation issued at all the three levels (European - national - regional), would create a new trend and would affect the strategy of many companies to develop products and services that are inclusive.

It is considered important to develop National legislation on inclusion with local implementation. Furthermore, it is recommended to provide sufficient freedom to accommodate European standards and directives at local level.

[25] http://bobby.watchfire.com/bobby/html/en/index.jsp

[26] http://www.rnib.org.uk/

3 Case Description *FernUni Hagen*

3.1 The organisation FernUniversität - Gesamthochschule Hagen (FU Hagen)

The Distance Teaching University *FernUniversität - Gesamthochschule Hagen (FernUni Hagen)* was founded in 1974 to provide distance higher education. It is the only distance teaching university in Germany and an integral part of the regular public higher education system. *FernUni Hagen*'s staff includes more than 1,700 scientific, technical and administrative employees. The annual budget in 2001 amounted to 84.3 Million Euro (including 19 Million Euro fees and third-party funding).

"There are currently over 59,000 students registered at *FernUni Hagen*. The six faculties are: Computer Science; Economics; Education, Social Sciences and Humanities; Electrical and Information Engineering; Law; and Mathematics. Programmes of study lead to traditional 'Diploma' degrees after three and/or four years' of full-time studies. In addition, the number of Bachelor's and Master's degree programmes offered is constantly increasing. On the whole, there are around 1,700 courses available for undergraduate and postgraduate studies as well as academic further education."[27]

3.2 Education and Knowledge Space: Virtual University

The InclusiveByDesign project set the focus on the evolving so-called *Education and Knowledge Space: Virtual University (LVU)*. As a contribution to *FernUni Hagen*'s customer (= user)-orientation, this concept aims at enabling full access to all courses and services via electronic communication and multimedia. "This '*Virtual University*' includes all teaching materials and events, the academic and administrative student support services, the administrative functions, the 'social life', the study material delivery, etc." [28]

Since *FernUni Hagen*'s initial launch of the *Virtual University* in 1999, the realization of the concept has been continuously expanded through pilot projects. Until 2003, all courses shall have been "virtualised". The overall process is coordinated by a specific department called *LVU office*. Currently, the *virtual university* includes 4 complete bachelor's degree programmes, approx. 215 virtual courses, 60 virtual seminars, and several virtual practical courses. Moreover, per year, approx. 100 video-conferences take place to prepare and perform exams. With one exception, the language of instruction is German.

The academic accreditation procedure has already begun for three of the online bachelors programs. The Bachelor' s program in Educational Science is expected to get accredited next year (in 2003), while the Bachelor's programs in Electrical Engineering and Computer Science will follow.

3.3 Striving for a usable, inclusive *Virtual University*

FernUni Hagen invests various efforts in achieving a usable, inclusive *Virtual University*.

3.3.1 Gathering the users' needs and requirements

Generally, every user, whether *FernUni Hagen* staff or student, is enabled and encouraged to develop ideas for new e-learning material or courses. Annually, these proposals are directed to a "user group" (about 20 members) arranged along the University's organisational structure which represents the *Virtual University* users (including students). Having collected all proposals, this user group seeks additional advice from an expert group, discusses the proposals, tries to achieve consensus and directs the selected proposals to the management of *FU Hagen* which is responsible for the final decision. In case of a positive decision regarding the discussed ideas, the realisation starts.

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[27] The FernUniversität - Gesamthochschule in Hagen, http://www.fernuni-hagen.de/FeU/Ueberblick/ueb_eng.html

[28] The FernUniversität - Gesamthochschule in Hagen, http://www.fernuni-hagen.de/FeU/Ueberblick/ueb_eng.html

Early in the development process of new e-learning material or courses, prototypes are evaluated by analysing students' interaction behaviour. This type of early evaluation is performed by the staff responsible for the course and is complemented by the evaluation approach described in section 3.3.2.

In the context of *FernUni Hagen*'s efforts to integrate students with disabilities, its *centre for research in distance education (ZIFF)* performed an explorative study regarding computer usage of this target group in 1999.[29] Jointly with students with disabilities, a survey was designed which aimed at eliciting:

- the extent of computer usage,
- perceived benefits and drawbacks of computer usage,
- awareness and usage of assistive technologies, and
- recommendations for the design and development of computer-based learning materials.

3.3.2 Evaluation of virtual courses and seminars

Due to its statutes, *FernUni Hagen* dedicates itself to evaluating all virtual courses and seminars in order to improve the didactical quality as well as the usability.

Primarily responsible for this is the evaluation department (3.5 employees), a part of *FernUni Hagen*'s Centre for the Development of Distance Education (*ZFE*, 39 employees). Evaluation is generally based on traditional and established evaluation methods, e.g., questionnaire-based surveys, interviews and participant observations.

Questionnaires are sent either online or paper-based, to all students attending the online course which is under evaluation. The questionnaires usually cover several dimensions, esp.,

- access to technologies,
- computer skills,
- assessment of presentation, interaction, communication and collaboration issues, and
- socio-demographic data.

In those specific cases, the effort to increase participation in these studies is rather high, and consequently additional financial incentives have been offered in order to increase the response rate. However, the students are usually rather willing to give feedback. In one case, participants of a virtual seminar actively discussed the evaluation results on-line. This evaluation was based on participatory observation by an evaluator. Out of these discussions, the students decided to develop a follow-up evaluation questionnaire on their own initiative.

Complementary, the students' exams are informally analysed, e.g., to discover topics in which students performed generally poor in order to review the respective learning materials for areas of improvement.

In the future, the *ZFE* is considering the introduction of novel, complementary evaluation methods, e.g., collecting feedback via integrated online feedback buttons, user tracking, or video conferencing. Additionally, the university-wide evaluation efforts will be standardised and coordinated by IT solutions.

[29] Ommerborn, R., Schuemer, R. (2001): Using computers in distance study: results of a survey amongst disabled students. Hagen: FernUniversität, Zentrales Institut für Fernstudienforschung (ZIFF)

3.3.3 Organizational aspects

The practical experiences being made during the development and evaluation of virtual courses and seminars are used to enhance the *ZFE* guidelines for the development of virtual courses, including didactical, technological and design issues. Furthermore, the experiences are disseminated in specific workshops which are performed by the coordinating *LVU* office.

In the context of human resource management, qualification in information technology as well as in foreign languages shall be given a higher significance in the future.

Moreover, national and international partnerships are rated as a necessary support for the development of the *Virtual University*. Examples are evaluations performed jointly with the Open University (UK)[30] and a recently launched collaborative national research project[31], both focussing on gender mainstreaming. Apart from that, *FernUni Hagen* is member of several international academic networks, e.g., *EADTU (European Association of Distance Teaching Universities)*, *EuroPACE 2000* (a European association of universities and industrial companies for multimedia-based teaching), and *ICDE (International Council for Open and Distance Education).*

3.4 User groups

In total, approx. 30.000 students currently have access to the *virtual university*. Since there is no specific data regarding this subgroup, the following data refers to the entire student body of 59.000 students. Due to its mission, *FernUni Hagen* addresses primarily "non-traditional"-students, i.e., people who traditionally would not have access to higher education, because of either location restrictions or schedule restrictions or both.

The majority (> 90 %) of the students are living in Germany, the remaining members live mainly in other European countries, especially in Austria and Switzerland, but also Hungary, Italy, Poland, Latvia, Russia, Turky, Morroco, and China. Nevertheless, in total, students from 110 countries are enrolled.

The target group of student users covers several dimensions:

- The age ranges between 18 and 75+ years (with an average of 29 years).
- Regarding gender, no explicit distinction was made during design (59 % male, 41 % female). However, gender aspects are considered generally in the evaluation research and within research collaborations mentioned in section 3.3.3.
- The target group comprises
  - full-time students (16 %)
  - employees (80%)
  - unemployed users
  - citizens who rarely leave their homes (including prison inmates)
- Although currently materials are offered both in print and on-line, it is not decided yet whether both options will remain in the future. However, it was identified that 85 % - 90 % of the students have access to the Internet, either via a private access or via the work place.
- Questions regarding disabilities are not part of the application forms of students during enrolment. In consequence, no statistical data are available on the prevalence of certain types of disabilities. From the implementation point of view of the technical platform, restrictions

[30] The Open University home page, UK, http://www.open.ac.uk

[31] Virtual International Gender Studies, http://www.vings.de

regarding visual capabilities are not directly addressed within the virtual university. However, additional audio or tactile materials are offered for selected courses without additional fee.

3.5 Diversity of users, technology platforms and usage contexts

The distance-learning platform developed at *FernUni Hagen* concerns mainly three aspects, those of providing learning material to students, student communication (with their instructors or with other students) and supporting instructors in their work. The target user groups of the platform are students, traditional or non-traditional, and staff with teaching or administrative duties. At present, just individual users are supported by the technical system, but it is planned to support teams in the future.

Within the framework of web applications, course material is offered either in the context of an academic degree, or in the context of high quality further education.

The e-learning platform is developed within the framework of asynchronous web technologies. The existing web functionality is generalized to most current browsers, including Unix and Macintosh versions, and even a LYNX version (for users who want very low or no graphics). Students do not usually have to install additional software components on their computer, although in some cases they get compact discs with course material. The equipment a student needs to access the distance learning service is a personal computer with a web browser and an internet connection. Fast internet connections are preferable, but a regular connection can also be accommodated, as course material can be distributed in the form of PDF files or HTML files. There is an effort made not to rely too heavily on graphics for transporting information necessary in using the material, so that, for instance, users with low vision using browsers without graphics can also access most of the learning material.

The typical course structure involves studying material through the web, readings, and downloads to the student's personal computer. There is also a support 'environment' of communication facilities integrated with the online courses, consisting of a special News Group for each course, mailing lists for each course, direct access to email and to communication with the course instructor, as well as lists of names of other students taking the course complete with addresses, telephone numbers and email addresses, so that students may contact each other. For particular courses, there are two or more News Groups for discussion or special topics; some of these News Groups are international.

Online courses and their corresponding communication facilities are now primarily designed in asynchronous ways. The current platform has been developed from two earlier prototypes, and in parallel a new platform is being developed, that will be ready for use in the year 2004. For this next platform there are plans for placing more emphasis on synchronous communication facilities, such as, for example, chat channels integrated into the e-learning environment.

Regarding student preference on the type of communication (synchronous or asynchronous), it is reported that the asynchronous format appears to fit very well with the FernUniversitaet's students' lifestyles, as many of them are employed (about 70%) and work on various time schedules, therefore the requirement of meeting in synchronous communication 'rooms' (e.g., chat rooms) could be more exclusive than inclusive. In fact they gain two important advantages by studying at *FernUni Hagen*, first that they do not have to change their geographical location to attend a University, and second that they can study at their own pace and at their own available time.

Although mobile technologies are not yet considered mature enough to carry file formats suitable to academic courses, there are some considerations for extending this framework also towards mobile technologies in the future. This should be feasible for ancillary course functions, such as those of uploading the results of an examination, or posing a short question to an instructor, or reading a notice posted by an instructor to the students. Another feature planned for the next platform concerns tracking the student's learning path through the course material, which will allow greater possibility for understanding students' course progress and perhaps even allow customisation and personalisation of the learning material towards each student's cognitive needs.

3.6 Product lifecycle: inclusive design practices

Implications of technologies and usage contexts for product lifecycle: The implications of available technologies are taken into consideration from the very early phases of the product lifecycle, in the concept creation and design phases. Separate teams work within the University on the computer technologies and on the e-learning technologies. The implications of different usage contexts (for example usage at home, or with an electronic notebook, or in the train) are already being considered for the future development of the e-learning platform.

Methods used for acquiring know-how: Relevant literature is examined frequently and systematically. Experts exist within the university (see section 3.3.3) and are consulted on usability and course evaluation matters, as well as in designing the social and communication aspects of the learning environment ("environments of use" of the e-learning platform), such as how courses are designed, or how students are working within the existing course structure. These experts from the university are involved in the requirements gathering and the testing and evaluation phases (see section 3.3.1 - 3.3.2). Expert consultation from external sources is occasionally requested on the more technical aspects of the platform as a system, for instance a workshop was organized in the University by an external company, in order to examine existing commercial e-learning platforms and determine whether any of those fit the University's projected needs for the future (a first review of similar products had already been done by the University at that point). At that particular point the initial product concept was already formulated and most of the requirements had been gathered, so the decision making referred to whether a commercial platform is adopted, or whether the University develops an entirely proprietary design, or a hybrid system. The external experts also contributed in the determination of some additional requirements.

Design and implementation: *FernUni Hagen* is the main developer of the e-learning platform, with only a few development aspects outsourced to external companies. The same plan holds for the next e-learning platform, which is currently under development. The design of this next platform is focusing on modular architectures, as well as on interoperability. With respect to adopting an iterative design process, there are two or three iterations planned for the design and the implementation process. At the moment *FernUni Hagen* chooses not to support different lines of development for the e-learning platform, so as to concentrate efforts on the modularity and interoperability between implementation modules of the product under development.

Testing and evaluation: The platform is tested and evaluated by usability experts within the University.

Introduction to market: Because of being an academic institute, and a public university, *FernUni Hagen* does not have an explicit marketing policy in terms of selling the e-learning platform as a product, advertising to end-users, beta-testing the product, etc. However, they are certainly concerned with making the platform attractive to students; the main reasons that make online courses attractive to students are, of course, the flexibility of study time and the geographical independence of the study location.

Accessibility: One of the important concerns of the e-learning platform's developers has been its accessibility by most current types of browsers, a goal that has been successfully met. The aspect of platform compatibility with disabled students' needs can be pursued in the future. One of the possibilities appears to be in the direction of using alternative digital media formats for delivery of course material, along with specialized interaction libraries, so that the platform can select the delivery medium that suits the student's needs in the best way.

Special tools: Online questionnaires are used for empirical data collection regarding courses and other aspects of the virtual university (see section 3.3.2). Regarding design and development, the development team of F*U Hagen* uses design aid environments, especially design tools for the technical platform. They also employ performance measurement tools to ensure the stability of the technical platform, to test that servers are running and to restart them if they are not (automatic recovery of systems).

Instructional design and evaluation: Some of the testing (mid-course student assessment) for online courses takes place through the web interface, although not the final exams. Course evaluation takes place with students being in touch with data collection representatives of the university, while taking the courses. When taking a course, students are asked to give feedback. Student surveys are carried out for some of the online courses. Another method used is to perform statistical comparisons between the examination results of different course versions, i.e., alternative instructional designs, such as traditional versus online course formats (see section 3.3.2).

3.7 Policy Issues

The case of *FernUni Hagen* to produce well designed products and services that are inclusive is not strongly affected by European, national or regional policies.

Two factors are the most influential as regards adoption of inclusive design: competition and 'customer's' needs. *FernUni Hagen* tries to meet the needs of its end-users (students and teaching staff) and also to be competitive against other higher education institutions.

The influence of European, national, and regional policies can be summarized as follows:

a. European Policies: The European Association of Distance Teaching Universities, which is co-financed by the European Commission, constitutes a major policy instrument of *FernUni Hagen* and other European distance-learning higher education institutions. It is a forum in which context members exchange views, identify and adopt best practices, keep contact and co-operate. Also, in the past *FernUni Hagen* has participated in projects co-funded by the European Commission in the context of programmes such as DELTA, COMETT, Information Society Technologies etc. that had to do mainly with multimedia pilot development and applications from which it gained experience and know-how.

b. National policies: at the national level, the only factor that could influence the policy of *FernUni Hagen* as regards inclusive technologies is legislation on these issues, which does not exist so far. *FernUni Hagen* has participated in multimedia projects financed by the Federal State.

c. Regional policies: the regional level is very important for *FernUni Hagen*, since it operates under the regional law. However, no influence of regional policy has been identified concerning inclusive design.

The main conclusions drawn regarding the policy perspective are as follows:

- *FernUni Hagen* would be willing to change its current strategy in favour of developing products or services that are inclusive if there were increased demand from the end-users' side.
- *FernUni Hagen* believes that a combination of legislation issued at all three levels (European / national / regional) would promote further the development and use of inclusive products and services. In this case, the most 'important' level is the European one, since *FernUni Hagen* competes (at least) at a European-wide arena.
- *FernUni Hagen* would be willing to participate in relevant European projects only if their viability could be ensured after the end of the co-financing period and secondly, if their objectives were relevant to its policy.

4 Case Description *EXODUS S.A.*

4.1 The company *EXODUS S.A.*

The company *EXODUS S. A.,* located in Athens / Greece, was established in 1994 and currently, engages 80 employees. In 2001, the company's turnover amounted to approx. 2 billion Drachmas (approx. 6 million Euro).

EXODUS provides "e-business solutions" which are "based on *EXODUS*' ready-made software products, customer-specific software, third party products and quality services offered by *EXODUS* and its partners. Services include the establishment, support, maintenance and evolution of applications, and also technology-related consulting and maintenance outsourcing."[32] Inter alia, the *EXODUS*' applications aim at supporting corporate knowledge management, e-commerce, and training and education. The latter branch is of particular interest within the InclusiveByDesign project, and is referred to as the "e-learning branch". Organisationally, two project managers and between three to ten multimedia developers are explicitly assigned to this branch. Furthermore, two company-wide departments contribute to the e-learning developments: a distinguished design department, dedicated to software and interface design, and a quality assurance department, consisting of four persons responsible for testing, documentation, manuals and quality management in general.

4.2 The *e.Learn* platform

Supported by a European collaborative research and development project,[33] *EXODUS* has developed an e-learning platform called *e.Learn*. The platform combines both synchronous and asynchronous training and shall facilitate the educational procedure in different phases from content preparation to content presentation. *e.Learn* is used as the basis for customized solutions. Moreover, the company offers the production of learning contents as well as the support of the entire deployment and change process.

e.Learn is currently the only e-learning platform developed by a Greek company. At the time of the case study, *EXODUS* co-operates with four Greek customers: two educational institutions (universities), one company (bank sector), and one organisation in the public sector. Overall, more than 220 users plus an unknown number of users of *e.Learn* used by the public sector organisation are working with the system. Future acquisitions shall aim at private or public high-schools. Moreover, by participating in conferences and fairs in Europe, *EXODUS* is considering to expand their market to other EU countries. The e-learning platform supports Greek and English language. Other languages could be integrated with low technological effort.

A clear national market position of *e.Learn* has not been developed yet. *EXODUS* hopes to benefit of the recognized trend to integrate learning platforms with corporate knowledge management systems.

To give an example for the pricing scheme, 200 licences of *e.Learn* would cost 10 million Drachmas (approx. 30,000 Euro), including customisation. In 2001, the turnover regarding *e.Learn* amounted to approx. 135 million Drachmas (approx. 400,000 Euro) in total. This amount does not include the sale of third-party contents.

4.3 Striving for a usable, inclusive *e.Learn* platform

EXODUS invests various efforts in achieving a usable, inclusive *e.Learn* platform. In the context of a specific customisation project, resources for requirements engineering and quality assurance are explicitly assigned, typically, approx. 15 % of the project budget for requirements engineering, and 10

[32] EXODUS - Introduction, http://www.exodus.gr/EN/introduction.htm

[33] Virtual Blackboard "Distributed Lecturing Environment" IST - 1999 - 12670, http://www.virtual-blackboard.iao.fhg.de

- 15 % for quality assurance. Approx. half of the budget for quality assurance is used for usability-related efforts.

4.3.1 Gathering the users' needs and requirements

In the beginning of a customisation project, the responsible project manager tries to gather the users' preferences and needs as well as the familiarity with computer usage and prior learning experiences. The final objective of this process is to increase the acceptance of the final system.

The collection of requirements starts with an on-site *interview* of one customer which usually takes between one and two hours. Based on the data extracted, *EXODUS* develops text-based scenarios (called "use cases") which illustrate the potential usage of the system. In order to get in-depth feedback, the project manager "walks" through these scenarios jointly with two or three future users which shall represent both, teachers / lecturers and students / learners. These users are selected by the customer, who is thereby supported by an informal definition of the "ideal" user representatives, given by *EXODUS*. Each walk-through is performed at the customer's organisation with one future user at the same time and takes between one to two hours.

Both, the customer interview and the scenario *walk-throughs*, are guided by checklists defined within *EXODUS*' quality management system (see section 4.3.4). All collected customer and user requirements are discussed within the development team and documented in a way that they can be reused in future projects.

The project managers are internally trained for this requirements gathering process. In order to assure a controlled development process, *EXODUS* intends to minimize direct communication between end-users and the technical development team. Rather, communication takes place between a technical consultant and the project manager preferably.

4.3.2 User satisfaction surveys

One specific member of the quality assurance department of *EXODUS* is primarily responsible for measuring the user satisfaction as well as assuring the usability of the *e.Learn* platform.

For each customisation project, questionnaires for measuring user satisfaction are developed. Besides branch-specific questions, these questionnaires are derived from several existing methodologies, especially the SUMI ("Software usability measurement inventory") method.[34]

An exemplary questionnaire includes

- 50 questions derived from SUMI, rating user satisfaction issues on a 3-step scale
- 40 complementary questions, rating issues like ease of use, perceived usefulness, learnability, robustness, and consistency
- further questions regarding socio-demographic data, computer skills, familiarity with the system and received training, resulting in a user profile that can be related to the user satisfaction data

Via the customer, the questionnaires are addressed to all current end-users, i.e., to the learners (e.g., university students, employees) and to the involved teachers or trainers. In case the customer organisation is a company, end-users, i.e., employees, are usually obliged to give feedback.

To enable a continuous improvement process, this procedure is performed up to four times during a project, e.g. every three months. Thereby, a slight rephrasing of the questionnaire is necessary to avoid results based on routine developed by the answering of questionnaires. However, the comparability between the different questionnaire versions needs to be assured.

[34] SUMI Questionnaire Homepage, http://www.ucc.ie/hfrg/questionnaires/sumi

In addition to this formal approach to gather user feedback, the collection of further user comments is supported by integrating feedback forms within the product. These forms enable the user to electronically inform *EXODUS* about needs that evolve during usage. The feedback is directed to the project manager.

The feedback collected by the survey or project manager is analysed at the quality assurance department and presented and discussed in a development team meeting. Possible conflicts due to contradictory users' requirements are additionally discussed between the project management and the customer. The finally derived new requirements are realised within the subsequent version of the system.

4.3.3 Usability inspections

Beyond the efforts to achieve high user satisfaction outlined above, the quality assurance department is responsible for inspecting the *usability* of the system. For *EXODUS*, usability is defined as: "The capability of the software product to be understood, learned, used and attractive to the user, when used under specified conditions." A special focus is set on error prevention and robustness of the system. Oriented toward third-party guidelines (e.g., Microsoft and Lotus), the usability of the current system version is inspected and additionally informally compared to other products, esp. prevalent office software products.

4.3.4 Organizational aspects

The activities characterized in the prior sections are significantly supported by the company-specific quality management system, called *SPOCS* ("Software Process Organization & Control System"). *SPOCS* was introduced in 2000 and is based on the well-known SEI Capability Maturity Model (CMM)[35]. The CMM defines five process maturity levels, ranging from the initial level 1 to level 5 representing the highest maturity. The efforts to achieve a usable, inclusive *e.Learn* platform are reflected in CMM's key process areas "Requirements Management", "Software Quality Assurance", and "Peer Reviews" and are addressed by *SPOCS*. Regarding these three areas, *EXODUS* aims at achieving at least the second maturity level, implying that the processes being performed are "repeatable" in future projects.

As mentioned above, methods used in requirements gathering or measuring user satisfaction are explicitly described in *SPOCS*. In case of practical problems while gathering user requirements or measuring user satisfaction, the respective process descriptions in *SPOCS* are changed to enable continuous improvement and organisational learning. The organisational knowledge inherent in the quality management system is one basis for the internal peer training at *EXODUS* which is complemented by external trainings, e.g. regarding usability.

4.4 User groups

The target user group, i.e., the group *e.Learn* is designed for, covers several dimensions:

- The age of the target group ranges between 15 and 54.
- Regarding gender, no explicit distinction was made during design.
- The target group comprises
  - students
  - employees
  - unemployed users

[35] Capability Maturity Model for Software, http://www.sei.cmu.edu/cmm/cmm.html

- citizens who rarely leave their homes (esp. by providing efficient communication via modem)
- foreigners / immigrants with different native languages (esp. by technological multi-language support)

- The needs of users with neutral or negative attitudes to computer usage shall be considered with the help of the continuous users' satisfaction surveys.
- The required familiarity with using computers is restricted to navigation skills. No programming skills are needed.
- The target group include both, voluntary users as well as persons being obliged to use the product.
- Restrictions regarding auditory capabilities are addressed by redundant synchronous communication channels (audio-based chat + text-based chat).

4.5 Diversity of users, technology platforms and usage contexts

Differentiations between the user groups addressed during the product development cycle can also be made on the basis of the particular role of each group in the learning process. The supported roles are those of Student / Trainee (role properties: progress through course material, personalisation, capability for online cooperation), Teacher / Trainer (role prperties: specification of learning material) and Manager / Administrator (role properties: user administration, control and maintenance of courseware).

The product is comprised from two parts, a server-side module for trainers and administrators and a client-side module for trainees. It supports customisation and parameterisation of the presented functionality during installation, in order to fulfil specific customer needs (functional and presentation requirements and preferences).

The *e.Learn* learning platform allows for integration of different types of course content. It runs on a variety of platforms such as internet, intranet, as well as mobile phones and PDAs. The technology platforms addressed during product development at the Server-side module are MS Windows (current) and Unix / Linux (under development). At the client side module, the platforms are Web (HTML, ASP, JSP) and WAP (access from mobile phones and PDAs).

Some key product features that provide evidence of addressing different technology platforms are the following:

a) The product is compatible with all major browser technologies (e.g., Netscape and Internet Explorer), and accessible from personal computer and mobile devices (mobile phones and PDAs).

b) The product (server-side module) has been developed both for the MS Windows and the Unix / Linux (under development) platforms. However, there is a different product version for each platform.

c) During the development process both ASP and JSP technologies are used to support different platforms (MS Windows, Unix).

d) XML components are also used for supporting the PDA platform.

The product development process addresses different usage contexts, such as training (usually in-house training, in companies), education (usage of the platform by Universities, educational organisations), as well as Learning Repository (the platform can be used to maintain and make available learning content and courseware components for use by anyone and from anywhere). The contexts of use that have been mostly considered throughout the development process and have

drastically influenced the different phases of the development are those of "Training" and "Education", while the third one ("Learning Repository") can be considered a by-product of the adopted specifications.

The key differences between the various usage contexts concern the structure of the courseware. In the training context instructional contents are more pragmatically oriented and based on exercises rather than on theoretical material. In the education context the courseware is more structured, based on a specific curriculum and providing student evaluation and advanced security options. Finally, the Learning Repository context has a flexible structure that can be revised and amended by content providers.

Additionally, learners can access the product from both desktop (at home, at work) and mobile devices (anywhere). A product feature that provides evidence of addressing different contexts of use is the fact that AICC standards[36] and recommendations are adopted, to support different content creators / providers, as well as continuous revisions of the learning material.

The dimensions of diversity that are mostly considered during the product development process is the one of usage contexts, followed by platform diversity. Particular emphasis has been given during the requirements, design and evaluation phases to address the needs of customers / end users in the training and education communities (see section 4.3), to build the required features in the final product, and to allow for additional customisation and parameterisation of the product (at installation). Also significant efforts have been made to address various platform technologies.

4.6 Product lifecycle: inclusive design practices

Concept creation: Some of the main contributing factors to the concept of the *e.Learn* product have been the company's previous knowledge and expertise in developing multimedia courseware (development of a commercial CD-ROM), as well as market monitoring. Another important factor has been the experience gained from participation in an IST (Virtual Blackboard) project, which aimed at developing an internet-based platform for developing courseware material. One of the outcomes of that project was an early product prototype, which became the basis for designing the *e.Learn* system.

Requirements gathering: Extensive analysis of user requirements was done for the three user roles with participation of end users, involving interviews and observations (see section 4.3.1). There was also reviewing of similar / competitive products on the market, as well as consultations with field experts.

Design: The product was designed as an internet platform, while user evaluation results during the development of an earlier prototype were also considered in the design phase. The process involved a 3-tier architecture, web-application standards, graphics design, the participation of experts (also in aesthetic design), and ongoing iterations. It was designed to be compatible with the technologies currently used within the company and also to fulfill the user requirements collected. SPOCS standards (see section 4.3.4) were followed during this process, as well as open standards (Internet, W3C).

Implementation: Standards have been followed for building educational materials (AICC / SCORM: ADL Sharable Content Object Reference Model [37]). Implementation supported open architectures and re-development was done to support the UNIX platform through JSPs and JAVA. The backbone of the system was based on an in-house developed technology of the company for asynchronous web applications, the e-Centric system.

Testing / Evaluation: Technical testing and evaluation was done by the Testing department of the company, when a first version of the product became available (iterative process). Techniques used

[36] See www.aicc.org

[37] SCORM Overview by ADL: http://www.adlnet.org/index.cfm?flashplugin=1&fuseaction=scormabt

included expert evaluation, user-based evaluation, field trials, and collection of user opinion (see section 4.3). Performance measurement tools were used regarding the technical platform, as well as usability evaluation tools.

Methods for acquiring know-how: Relevant literature is reviewed and expert consultation is sought in the initial stages of the product lifecycle. Additional methods used are the examination of case studies, the review of similar products on the market as well as the examination of available technologies, the compliance with standards and recommendations in the domains of e-learning and usability (see section 4.3.3).

Special tools: Design aids environments and special design tools, along with prototyping and special implementation tools / toolkits are used in the main design and development phases, while compliance testing, usability evaluation and performance measurement tools for the platform are used in the second half of the production lifecycle.

Introduction to market: Strategies exist within the company for the diversification of marketing channels, according to user categories, platforms and usage contexts.

General view of company concerning Inclusive Design: Inclusive design has the potential of pushing the company towards using more "open" tools (open standards). It can also make the company technologically more competitive. It is definitely not an aspect to be avoided; on the contrary, the company is openly seeking the best approach to it its systematic incorporation.

4.7 Policy Issues

The strategy of the company to produce well designed products that are inclusive is strongly affected by European policies.

The company is involved in many European projects that require to respect guidelines and standards for the design of products and services. The exchange of experience and the transfer of know how among the partners of the European projects has a very positive effect on the policy of the company to produce well designed products that are used by different types of users.

At national level, the company is implementing a project for the Ministry of Education, on multimedia applications for education. For this project, *EXODUS* cooperates with the Institute of Computer science in Patras and it is planned to design the final products in an inclusive way in order to meet the educational needs of different types of users.

EXODUS strongly believes that a combination of legislation issued at three levels, European/National/Regional, would create a new trend and the impact for the company to develop products or services in an inclusive way would be more effective.

For future developments, the company consider important, for the European Commission and Greece to:

- recognize the access to ICT as a right for all citizens (thus compelling companies to produce inclusive products)
- establish European guidelines and standards
- stimulate companies (i.e. free of charge services, code of practice etc)

5 Case Description *Electric Paper*

5.1 The company Electric Paper (EP)

In 1988, *Electric Paper (EP)* was established in Dublin / Ireland. The company started in the field of multimedia presentations, turning to the e-learning field in 1993. Since 1996, *EP* has concentrated on creating interactive learning, testing and certification products for computer literacy[38] and the company released its first commercial product in 1998.

Currently, 85 employees are working for the company at the headquarters in Dublin as well as at marketing units in the UK, in Australia, and in the US. In 2001, the turnover amounted to more than 7 million Euro, the profits to more than 1 million Euro. The company was ranked as the fifth fastest growing technology company in Ireland[39], and as the 74th fastest growing technology company in Europe.[40]

5.2 The products

EP's product family is delivered via Internet, local area network (LAN), or CD-ROM and can be divided in three areas:

a. End-User Certification (ECDL)

b. Everyday Computing

c. Constituency Products

80 % of *EP's* revenues are achieved by the first area. This product was "the first multimedia courseware to be approved by the ECDL"[41] (in 1998) and comprises three components for

- self-assessment,
- interactive learning, and
- automated certification testing[42].

The company success in the past has been based on the End-User Certification area and the ECDL programme in particular. EP has sold more than 500,000 individual licences for the learning materials (as well as over 700 network licences), and more than 300,000 tests (at more than 400 sites). Depending on the volumes purchases, the price of the complete ECDL package ranges between 50 and 500 Euro per license. Meanwhile, *EP* reports to be one of the market leaders in Ireland, the UK, and Australia. In co-operation with UNESCO, the automated certification testing solution is planned to be implemented in 20 Arab countries. In addition to the target markets already mentioned, *EP* sells learning products in the US, in Canada, and in South Africa.

The economic significance of the second area (Everyday Computing) is increasing. Compared to the ECDL package, the *Everyday Computing* products aim at acquiring more *basic* "digital literacy" skills, trying to address issues known as the "Digital Divide"' or "E-Inclusion". The company has already been involved in projects where the target group amounts to more than 1 million users.

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[38] http://www.electricpaper.ie/ep/company/history.asp

[39] http://www.electricpaper.ie/ep/news/feb02_3.asp

[40] http://www.electricpaper.ie/ep/news/apr02_1.asp

[41] http://www.electricpaper.ie/ep/company/history.asp

[42] In 2000, this component received the award "Generic Product of the Year" (http://www.electricpaper.ie/ep/news/oct2k_1.asp) in the context of the World Open Learning Conference and Exhibition - WOLCE (http://www.distancelearning.co.uk/Insides/Exhibition/Exhib.html).

The third area (Constituency Computing) refers to products customized to certain constituencies of users in different learning contexts (e.g., training for child care workers across rural areas in Australia) and/or certain learner groups (e.g., children or senior citizens).[43]

Typical customers of *EP* are organisations in the public / government sector (e.g. libraries or public employers), in the education / training sector (e.g. training companies), and in the commercial / corporate sector.

5.3 Striving for usable, inclusive e-learning products

EP invests various efforts to achieve usable, inclusive e-learning products. Some facets are externally acknowledged by the Institute of IT Training (IITT)[44]. As currently one of nine companies,[45] *EP* has achieved the "accreditation for its commitment to high quality and process improvement in the provision of training through the use of technology based training materials or e-learning methodologies"[46]. The requirements for accreditation include the conformance of the company's products with IITT's quality standards regarding "integral learner support, content, interactive design, navigation, usability, media quality, and technical quality".[47]

5.3.1 Design process: Script writing

Approx. 2/3 of the entire project development budget are usually spent for the *design* of a specific product. The product life-cycle starts with a well-defined, four-phases design process, the so-called *script writing* process. A *script* is understood as a detailed, explicit specification of a learning course including learning objectives, learning scenarios, interaction and dialogue sequences and interface specifications. Two groups are involved in this process: on the one hand, the *experts* for the specific learning *content*, and on the other hand, the *script writers* who are responsible for creating the specification, and thereby act as the "users' advocates".

5.3.2 Usability inspections and benchmarking

EP's products are continuously benchmarked against third-party products as well as against other in-house products. Primarily, this benchmarking procedure is performed by an internal expert and covers both, usability and didactical aspects. The usability criteria are partly inspired by international standards like ISO 9241[48] and include (inter alia) the following issues

- general interaction, e.g., controllability or error tolerance,
- navigation, e.g., existence of exits,
- orientation, e.g., visibility of learning status,
- robustness, and
- aesthetics.

In one specific case, the benchmarking pool comprised one *EP* product and five competitors' products. Guided by the list of criteria (in total > 40), every competitor's product was explored and compared to

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[43] For this project, EP received the award "International Training Project of the Year 2002" by the Institute of IT Training (http://www.iitt.org.uk/public/awards/awards2002.asp).

[44] http://www.iitt.org.uk

[45] http://www.iitt.org.uk/public/find/providerresults2.asp?elearning=1

[46] http://www.electricpaper.ie/ep/news/may02_1.asp

[47] The Institute of IT Training's standards - Standards for e-learning materials: http://www.iitt.org.uk/public/standards/e-learningmatsstand.asp

[48] Ergonomic requirements for office work with visual display terminals (VDTs), http://www.iso.ch

EP's product. More specifically, for each criterion, the expert rated the quality of the competitor's product, on a 5-step scale ranging from "much worse than *EP's* product" to "much better than EP's product". The rationales for these ratings were explicitly documented.

Furthermore, the company did charge an external expert with a comparative assessment of several e-learning products (including one product of EP), using different assessment criteria.

The results of such benchmarking procedures are used for areas of further improvement in the future.

5.3.3 User feedback

In addition to expert-based usability inspections, *EP* performed usability tests involving end-users. Before the introduction of one specific product, several prototype versions were presented to more than 150 users in the UK, in Canada and Ireland. Guided by qualitative questionnaires, the usability of the current prototypes was assessed. Moreover, the product was evaluated by three external educational experts. The collected feedback was used to improve the final product.

Complementary to these approaches, the results of the automated ECDL certification testing are informally analysed, e.g., to discover topics in which learners performed poor in order to review the respective learning module for areas of improvement.

Besides, the success rate (> 90 %) of learners using *EP's* ECDL learning course might be an indicator for the usability of the products.

5.3.4 Feedback by customers and user representatives

Because of the wide target audience, feedback by customers and/or user representatives, gathered by the marketing team, is of special importance for the company. For example, during the development of products for schools, prototypes are regularly presented to *teachers* to elicitate their feedback. During the usage of delivered products, most feedback is obtained by *training managers*.

Another type of valuable feedback is collected at fairs, while demonstrating products to potential *customers*. *EP* estimates the general customer satisfaction as very high, based on the rapid growth of the company, in spite of a rather competitive market situation.

A project in which *EP* co-operated with a national illiteracy group (National Adult Literacy Association (NALA) in Ireland) is one example for the involvement of *user representatives*.

5.3.5 Organizational aspects

The company's staff can be differentiated in the following areas:

Scripting & Instructional Design (esp. script writers, content experts and usability experts)	10 persons
Development & Technology (e.g., graphics designers, user-interface developers, researchers)	35 persons
Commercial (esp. marketing, sales)	25 persons
Management	10 persons

The design and development staff receive internal training on user-interface design, usability and the underlying didactical issues. Complementary, exemplary benchmarking results (see section 5.3.2) are presented. However, this training intends to improve the employees' usability skills while minimizing the influence on their creativity. Therefore, the presentation of competitors' products is restricted to few significant examples.

The efforts in qualifying *EP's* employees are externally acknowledged in the context of the IITT certification (see section 5.3) which, e.g., requires the designers' competencies to perform a task analysis or to develop learning strategies.[49]

5.4 User groups

According to *EP's* slogan "Extraordinary E-Learning for Ordinary People", the target user group is characterized as "ordinary, everyday people". The following dimensions are addressed:

- The products are primarily designed for adults (Aged 15 to 54) but also children and elderly citizens are using them successfully.
- Regarding gender, no explicit distinction was made during design. Within the context of one project, women returning to their jobs after a long period of absence were specifically addressed.
- The target group comprises
  - students,
  - employees, and
  - unemployed users.
  - Foreigners / immigrants with different native languages shall be addressed in the future by providing a help system with subtitles in a second language.
- The needs of users with negative attitudes to computer usage are esp. considered by giving them control regarding interaction speed.
- Especially the *Everyday Computing* products are designed to require no familiarity with using computers.

[49] The Institute of IT Training's standards - Code of practice for e-learning providers: http://www.iitt.org.uk/public/standards/e-learningcode.asp#developer

- The target group includes both, voluntary users as well as persons being obliged to use the product.
- Restrictions regarding auditory capabilities are addressed by providing all instructions both, on-screen and via audio.
- Significant restrictions regarding visual capabilities (esp. (non-rectifiable) low vision and colour blindness) as well as motor impairments (e.g., resulting in an inability to control the mouse) are planned to be addressed in the future.

5.5 Diversity of users, technology platforms and usage contexts

The following key features of the company's products may provide evidence for the capability of addressing diverse user groups:

a. The availability of tutorial sessions to introduce users to new concepts, such as tutorials on how to use a mouse or mouse device (e.g., a trackball), or a laptop keypad.

b. The use of multiple media (image, audio, text on screen) as well as interactivity to facilitate and individualize instructional design according to a student's modality preferences (visual, auditory, kinesthetic) for more efficient learning.

c. The existence of documented instructional methodology; different learning methods can be used, to suit student competencies and preferences.

The company's emphasis is currently on developing applications for the personal computer, and on designing mostly for the Windows platform, including PC, network and internet versions. Some products have been additionally developed for the Macintosh platform. Regarding future R&D, the company is increasingly devoting attention to mobile devices and platforms, such as the Pocket PC and Palm devices, so that their e-learning products also become accessible by people on the move. A key feature that provides evidence for addressing multiple technology platforms is the fact that the company's software products are designed to run with the lowest common denominator of bandwidth requirements.

The product development process aims at addressing different contexts of use, such the workplace, the home or the classroom. Features that provide evidence for that are the following:

a. The products have capabilities of student assessment and recording of scores.

b. The products have tracking capability, i.e., they incorporate functionality dedicated to keeping track of the student's stage in learning process. Learning material and progress records can be saved on diskette and reloaded later, to continue from the point the student stopped previously.

c. The products have note-taking capability ("Save notes" / "Retrieve notes" functions).

All design parameters (regarding users, platforms and contexts) are taken into account from the beginning of the design phase. There is no difference on the emphasis placed on particular interactive aspects, regarding specific types of users (i.e., all users are given equal consideration).

5.6 Product lifecycle: inclusive design practices

What follows is a narrative description of the main phases in the product's lifecycle.

Concept creation: Senior members of the company together with consultants determine new concepts for products to be developed. For instance, by looking at the issues of external certification (e.g., ECDL – European Computer Driving Licence) they determined that there was a market for online certification products. Several teams are usually involved in the process, such as the marketing team, the instructional design team, etc. Another part of this process involves benchmarking with competitive products in the market.

Requirements gathering: This phase includes market surveys and user requirement surveys. Feedback for ongoing version design is received from the existing customer base, while third-party comments are also requested. The obtained feedback is re-directed into the early stages of new versions, thus completing one iteration cycle (see previous sections on *'User Feedback*' and *'Feedback by customers and user representatives'*).

Design and Implementation: EP adopts iterative design practices, for instance, one of the current products (ECDL Courseware) now in version 5, has already gone through 4 iterations of evaluation and re-design. The design process involves different aspects; those include writing scripts, enforcing a level of linearity during the learning procedure, and preserving flexibility in terms of the user's ability to choose paths of action. The need for different metaphors and interaction styles (for instance, when addressing younger children or older adults) is taken into account, so as to adjust the product's interaction style to the user's cognitive level. On the more technical side, product design and implementation are evolving towards the use of learning objects.

Implications of technologies and usage contexts for product lifecycle: Overall, the design process can be characterized as evolutionary and driven by end-user comments, while preserving conventional design guidelines such as linearity and focus on metaphor. Some of the future prospects of the design methodology employed are a Common Learning Framework, and Device Independence.

Testing and evaluation: The process involves seeking feedback from end users. The R&D team creates prototypes, takes them to the market and tests them for acceptability, as well as determining whether the prototype meets the requirements set during the concept creation and design phases (see section on *'User Feedback'*). Often these tests take the form of group field trials.

Methods used for acquiring know-how : EP has in-house experts regarding inclusive design concepts and practices. User groups from third -level education and industry bodies are asked to offer their input at various phases of the product lifecycle. External experts are used to audit quality control aspects of the development process and EP is looking into acquiring additional external expertise in the area of usability testing for future products particularly those involving new platforms and user groups.

Accessibility: In most of the new products being developed graphics are designed in a way that they can be enlarged on-screen. All software instructions are presented in alternative modalities, on screen and via audio. There are future plans for addressing the needs of users with very low vision, color blindness and motor impairments.

Other inclusive design practices:

- The company's technology support team maintains a database of customer queries and requirements, which are then considered during the requirements gathering phase of new products or new versions of the same product.
- There is participation of designers in strategic decision making within the company and frequent communication between teams, so there is multi-disciplinary collaboration affecting the evolution of product lifecycle.
- The R&D group is involved in technological research by researching and prototyping new products, as well as in acquisition of know-how regarding special topics (such as theory and implementation of learning objects), industry standards for content delivery, usability and accessibility, and comformance tests for compliance with industry standards.
- The company frequently trains its production teams on issues of user-centred design.

Overall view on Inclusive design: Overall, EP does not view inclusive design as an approach substantially different from the company's existing mode of operation, therefore they do not feel that inclusive design poses difficulties or heavy demands, regarding potential changes in this direction from existing company practices. Instead, inclusive design is viewed as an key investment in ongoing product quality, and therefore as a necessary ingredient of the product lifecycle.

5.7 Policy issues

"Extraordinary E-Learning for Ordinary People" has been EP's original inclusive purpose since its beginning. However, EP's development strategy in the field of ICT training products has been greatly affected by National / European legislation and programmes.

Provisions and funding to raise ICT awareness for the general public drove the company's focus onto inclusively designed products. EP has aimed to build products which would be useful for "ordinary" users belonging to different age groups and possessing a variety of educational backgrounds. The main stimulating policies which made this company create well designed products that are inclusive have been ESF funding, Regional policies (Europe-driven) and all those programs and measures related in someway with ICT diffusion.

Thus economic incentive (which is also the European Commission's approach) has been the most effective tool in influencing EP's development and commercial strategy. The company started on this direction of inclusive design because they thought it made good sense commercially and business-wise. They are now going to focus on the development of accessible products for groups with special needs, like people with disabilities. It will probably be one of their objectives in the near future.

Regarding policies of other regions or countries that have had an impact on companies' strategies to develop well designed products that are inclusive, EP is aware that:

- USA Government suppliers are obliged to provide accessible ICT products
- Australia has followed an approach more similar to Europe's, by employing positive measures and economic incentives to foster products accessible to people with special needs.

Concerning legislation issued at different levels (European, national, regional), EP has affirmed that even local measures are often driven by European directives. European policy has spread its most important effects at national level (see all the national action plans in various fields). In Ireland the European Computer Driving licence has been a huge success.

Among different types of policy which could have from now on an effect on stimulating the company to produce products or services in an inclusive way, EP thinks that European programmes / action plans like e-Europe have been and are the most important. National legislation could be considered the second best option, since National action plans and guidelines as well as Regional policies should be regarded as measures linked with Europe in one or another way.

The most relevant / attractive overall strategy at European, National or local level, at least for a company like EP which develops products to e-train people, could be expressed as: " Recognising the access to ICT as a right of any person (thus compelling industries to produce Inclusive products)". In addition, EP thinks that the idea of stimulating industries with a sort of IBD label, for instance like the Swedish TCO, could prove appealing.

On the other side, according to EP, it would be almost impossible to create a policy of regulating IT product sales within one or more countries based on the degree of products' inclusiveness, because of problems regarding both the organisational / practical point of view, as well as the definition / "objective" evaluation perspective.

EP already performs usability tests involving end users, but of course, the more customers' demand develops in the direction of inclusively designed products, the more EP's inclusive strategy will be strengthened.