IDCnet

IST–2001–38786 IDCnet

D3.2 - Identifying Core Knowledge and Skill Sets for Model Curricula: update

Abstract:

This deliverable presents state of the art in curriculum development work, and compares IDCnet to it. Next it discusses the methodology followed to identify key knowledge and skill sets for Design for All.

The categories of knowledge thus identified are organised into a taxonomy with examples given for each category and subcategory along with a set of learning outcomes. The purpose of the taxonomy is to structure the knowledge.

As this deliverable was a 'living' document, and as further activities have taken place since this deliverable was first submitted, this version includes a substantially expanded chapter 5, incorporating comments from: the project review process; the new members of

Abstract:

IDCnet; the second IDCnet workshop; as well as comments received from colleagues in response to dissemination activities at conferences. The categories and subcategories of the taxonomy remain unchanged, but further topics and examples have been added to illustrate and clarify the use and range of each category.

Finally, the next steps in the IDCnet WP3 strategy are briefly described.

Keywords:	Design for All, identifying core knowledge and skills, curriculum development, curriculum design, teaching pilots.

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. e.g. Accept, Develop, Modify, Rework, Update

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1 Executive Summary

The purpose of this document is to present IDCnet's progress on identifying key knowledge and skill sets for Design for All in sectors related to the Information Society. The work of IDCnet is to support the eEurope's objective to produce curricula **recommendations** on Design for All for designers and engineers in the field of ICT [1].

Design for All, while it cannot be considered as a discipline in its own right, is largely not catered for within existing related courses on HCI, design and computer science. As our results show, there is also a place for Design for All topics in other disciplines, such as business oriented studies, like management and marketing.

Design for All knowledge sets and skills can therefore be viewed as falling into two main groups. The first contains knowledge sets and skills that could be picked up and used in many subject areas, with some tuning. The second group of knowledge sets are related more specifically to the ICT sector. However, it should be borne in mind that in the increasingly networked information age, where embedded technology surrounds us, in all manner of devices, the work carried out in the ICT design sectors is less and less well defined and flows into other areas, as can be seen with applications of smart gadgets, wearable computing and ambient intelligence, requiring for instance, far greater anthropomorphic and ergonomic input than has previously been the case.

Central to this report, is the outcome of the strategies used to identify knowledge sets and skills, which has taken the form of a taxonomy, in order to give structure to the body of knowledge. The categories and subcategories within the taxonomy are meant to be broad enough to endure, although the specific topics and examples that fall within them are sometimes time dependent. Such is the nature of the subject, closely linked to advances in technology, that the content of some categories will need continual updating. However, it appears that, consistent with other methodologies for shaping curricula recommendations, the basic categories and subcategories for the body of knowledge are now defined.

As this was a 'living' document, and further activities have taken place since this deliverable was first submitted, this version presents a substantially expanded chapter 5, incorporating comments from the project review process; the new members of IDCnet; as well as comments received from colleagues in response to dissemination activities. The categories of the taxonomy remain unchanged, but further topics and examples have been added to illustrate and clarify the use and range of each category.

2 Introduction

The task of IDCnet is to further the inclusion of Design for All into curricula. The experience of the members of IDCnet is mostly to do with University education at all levels, but this does not mean that the work carried out here is exclusive to that level of teaching or learner base. The workpackage that is the subject of this deliverable seeks to define the superset of the sets of knowledge that make up Design for All topics, and to lay out some explanation of what these include, and in what context they could be taught. As such, this is not a curriculum in the narrow sense of the word, with a bounded set of objectives and learning outcomes, complete with teaching strategies and assessment and evaluation structures, but a taxonomy of Design for All knowledge, from which to draw curricula recommendations.

Design for All is at the same time a philosophy and a movement. It can be seen as an extension of HCI, but it should not be seen as a discipline. This is neither a new genre of design, nor a separate topic. It is a general approach to designing in which designers ensure that their products and services address the needs of the widest possible audience, irrespective of age or ability [2]. For this reason, knowledge sets and skills described here are to be considered as topics to be picked up and incorporated into existing curricula. The time is right for this. The work of the Design for All movement, the increasing voice of the disabled community, to a great extent empowered by technological advances, along with the climate of change within scientific disciplines, that are undergoing deep shifts of the paradigms upon which they are founded is leading to re-design of curricula and research policies in areas that are fundamental to the Information Society [3].

3 Curricula Recommendations: Methods and Practices

Curriculum design and development is the subject of much collaborative research. Recent years have seen much activity within this area. The reasons for this are several, amongst them:

- The breaking down of boundaries between disciplines and the emergence of new disciplines, resulting in requirements for learning that are based in inter-disciplinarity and multi-disciplinarity

- The needs of industry for more employees who demonstrate flexibility, the ability to think critically, to undertake complex problem solving activities, with well developed communication and interpersonal skills, particularly since much design and development work now takes place within the framework of multidisciplinary teams.

- In the European context, and not only, the need to have equivalences of learning and knowledge acquisition experiences, so that accreditation gained at one institution is valid in other geographical areas.

- In the context of continuous learning, it is seen as more important for learning at university or on professional development courses to enable the learner to possess the groundwork to update his knowledge as and when needed, rather than transfer a specific body of knowledge and techniques, that may become quickly obsolete.

Put another way, course and curriculum design is changing. "There are increasing social and economic pressures on higher education to generate a wider range of knowledge, skills and attitudes for coping with the demands of our 'supercomplex age'. The current pace of technological and social change is impelling teachers to think in terms of educating students not for today's problems but for those of tomorrow." [4].

Among the many different conceptions of what a curriculum is, a useful broad definition is that "the curriculum is the design for good and successful student learning" [5]. According to this interpretation, curriculum design includes considerations of

- what is to be learnt – knowledge, skills and behaviours (outcomes)

- why it is to be learnt – rationale and underlying philosophy

- how it is to be learnt – process (this includes debating the teaching to support, the way learning will be demonstrated and achievement assessed)

- when it is to be learnt – structure of the learning process.

The work described in this deliverable concerns mainly the first point, identifying what is to be learnt.

Other educational experts [6] take a finer grained view of the process of designing the curriculum, approaching the design at the course level. At this level the tasks seen are to:

1. establish need and demand for the course

1. establish student characteristics,

2. determine content

3. set goals and objectives

4. choose teaching and assessment methods

5. implement, evaluate and adjust components as necessary

In our case, it is not possible to follow this sequence, because we are not at the level of granularity of designing a course. However, the list should be retained for the other important lessons it offers, for instance, the need to establish student characteristics.

The methodology followed by IDCnet has broadly been that followed by the IEEE/ACM joint activities on curricula recommendations [7], namely to gather together a large number of experts to define a body of knowledge, to divide it into areas, and then assign a group of experts to each area to further distinguish topics within these areas.

This methodology has been followed for several reasons. First is that the aim of IDCnet is not to produce complete curricula, but recommendations. Therefore this methodology was more appropriate than other curriculum design methodologies which concentrate on creating a complete curriculum as an independent entity. This approach is not appropriate for Design for All since it cannot be described as a distinct discipline, and therefore it cannot be taught in isolation from other subjects. Indeed, Design for All can be useful introduced into many subject specialities, from Architecture to Marketing. Further this methodology enables flexibility; topics can be added or discarded as technology advances, as well as a structure for all efforts to be mapped to, aiding curriculum designers to acquire an overall picture of the subject without needing to be experts in every area.

A review of the contemporary literature on curriculum development indicates that much of the existing work either: (a) focuses on the development of educational resources; or (b) identifies desirable features of development methods without providing any practical guidance [8]. For this reason, the next section discusses what has been done as funded work on curriculum development within the EU, and measures the work plan and strategy of IDCnet against it, in order to better comprehend the scope of activities within this work package.

3.1   Curriculum Development activities in Europe

The EU, through its DG on Education and Culture and its programmes Socrates and Erasmus has funded a large number of curriculum development projects [9]. These projects support three types of activities in the area of curricula jointly developed by universities.

- Projects for the *joint development of "study programmes"* at any level, from undergraduate to intermediate, advanced ("Masters") and Ph.D. level;

- Projects for the *joint development of European "modules"*, such as specialised language modules; courses on history, society, culture, politics of other European countries; aspects on European integration or comparative aspects relating to the content of a given discipline;

- Projects for the *implementation and dissemination of curriculum development projects* which have completed their development phase.

A report [10] evaluating the progress and results of ongoing and finished projects in the period 1996—1998 found the following characteristics, which are reported below and compared with the aims and achievements of IDCnet.

- Most projects concentrated on the formal aspects of curriculum i.e. content and objectives, rather than its operational aspects e.g. teaching and learning aspects, or grouping of students, or evaluation methods, etc.

IDCnet is also in accord with these trends, the first step in any endeavour at curriculum recommendations is to determine the body of knowledge to be learned.

- The two most popular objectives for curriculum development activities and thematic networks funded by the DG Educational and Culture were "Providing quality education and/or specialised training for students" and "Meeting the needs of industry or other external groups". Less frequent objectives (5% to 8% of projects) included 'supporting the development of particular subject areas', and 'informing policy-making.'

Here IDCnet differs from these curriculum development projects in that while it did seek to meet the needs of industry, there are no other external groups, such as formal associations from which it can seek approval or accreditation. Nor does IDCnet want to view Design for All as specialised education. Rather it sees that knowledge about Design for All should be 'infiltrated' into various disciplines and curricula. IDCnet however, does place great store on informing policy making, because it is important in this time of changing curricula to make sure that the re-engineered curricula include Design for All.

- With regard to the means used to reach the objectives. nearly all the projects mentioned the development of courses, modules, and teaching materials. Two other means were frequently mentioned: "working together to identify common elements, comparing educational programmes or material, exchanging ideas and pooling expertise" (around 20% of projects) and "including recent research findings in teaching".

Given the short time frame of IDCnet, the funded part of the network does not foresee the development of courses, modules and teaching materials in any systematic way. Instead, use of teaching pilots (unfunded activity) will be made to validate the categories of knowledge sets and skills. In addition, again as unfunded by IDCnet, and indicative of the network members' interest in this area, an attempt will be made to make available material for others to pick up and use, when this does not contravene copyright of the institutions that develop the material.

With regard to "identifying common elements and comparing programmes", "exchanging expertise and including recent research findings", this has been the work of this work package so far.

- Considering the content and methods, a high percentage of projects (66%) reported having an interdisciplinary focus. This may be related to the fact that much cutting-edge research is now being carried out in interdisciplinary areas and that the labour market expresses the need for fewer single subject specialists and for more people who are capable of working in interdisciplinary fields.

As noted above and elsewhere, Design for All is in essence a horizontal subject, which needs to be incorporated into design sectors of all types, everywhere where human 'users' are involved.

- Problems led to readjustment of objectives: In two cases (13%), the development of joint (core) curriculum was replaced by the development of a broader "body of knowledge". One of the greatest problems was the difficulty of integrating the courses or curricula into the existing study programmes. Institutional, national, and disciplinary barriers were mentioned by the project leaders as contributing factors.

It is for this reason that IDCnet has as part of its work plan and activity to influence educational and research policies and strategies.

This section serves to justify the strategy followed by IDCnet as part of the larger curriculum development picture.

3.2   The relationship between curriculum and current thinking on teaching methods, strategies, learning philosophies

As has been seen there are different beliefs, values and ideologies in relation to course design. Traditional curriculum design has tended to

focus on the transmission of discrete pieces of information, -frequently facts and formulas,-from instructor to learner. This is because the information is considered important in its own right. However, it is well understood by educationalists that information takes on more value when it compliments a need for information. Traditional curriculum design does not reflect this reality, and therefore it often does not provide students with opportunities to develop the kinds of critical thinking skills and problem-solving abilities that are central to thinking and learning [11]. Furthermore, traditional curriculum design does not include opportunities to build the kinds of personal and collaborative skills that support learning [12].

With regard to teaching and learning strategies, curricula most likely to be found at University level follow pedagogical models that range from traditional or discipline based, through performance or system based, to cognitive, personal relevance/experiental and socially critical [6]. In contrast, the current thinking encourages the following trends: firstly to have a project or problem based curriculum; and secondly to have intended course outcomes that encourage analysis, synthesis and application. The rationale is that the action of doing, coupled with reflection on this action, will help towards the generation of new and meaningful learning experiences.

At the same time a whole host of teaching and learning strategies are proposed, such as

- Deep, surface and strategic approaches to learning
- Personal learning styles
- Life long learning and self directed learning
- Generic objectives and transferable skills
- Small group (tutorials) and large group teaching
- The role of practicals and demonstrators/teaching assistants
- Flexible learning/flexible delivery, including teaching with new technologies

Of all this wealth of material on curriculum and learning, the main import for the IDCnet work package on identifying core knowledge and skill sets, is to help to define these sets by setting up learning outcomes for each category of knowledge that has been defined in our taxonomy. That is, although our task here has been to define and document a body of knowledge appropriate for guiding the development of curricula, this body of knowledge can be used to formulate guidance for pedagogy.

3.3   What are learning outcomes?

As previously stated, in the older teacher-centred approach, teaching was generally seen to be about the transmission of knowledge. As a result, the

focus was on what the teacher did, and course objectives were expressed in terms of the content which the teacher would transmit. In the newer learner-centred approach, however, the focus is on what the learner does. The goals of course of learning are nowadays usually expressed in terms of how the learner will be changed as a result of the course. The statements describing the change in student behaviour which should result from taking the course are known as 'intended learning outcomes'. Teaching then becomes a series of strategies which are devised in order to help students achieve these outcomes.

Learning outcomes are considered to be of primary importance in developing topics or subjects, because they point to the content of the subject, to the appropriate ways of facilitating teaching and learning a subject, and to the appropriate ways of assessing the subject. Thus in a 'bottom up' way, the learning outcomes help to shape and structure the content.

Although often used interchangeably, there is a difference between learning outcomes and learning objectives that is to do with level of specificity [13]. Objectives are strict and, usually, very detailed behaviourist statements which specify *exactly* the action that is to be assessed. Outcomes tend to be more holistic descriptors of the overall goal [14].

Thus to be consistent with current pedagogical thinking, the emphasis should be on learning and not on teaching. Design for All educators should think in terms of what they want the students to learn, rather than what they will teach. Thus each category of knowledge should be associated with goals and learning outcomes.

In addition, the emphasis on the learning experience, as opposed to the teaching method, allows for a constructivist approach to learning, whereby the learners are led to understand the knowledge in a structured way that enables them to view learning as a cumulative experience, acquiring knowledge that is open ended, and enabling them to build upon existing knowledge as the field moves on.

Therefore although the activity described in this workpackage is principally about identifying knowledge and skill sets, rather than about their packaging as instructive content, two suggestions to refine the taxonomy presented in Helsinki are present in this document.

Firstly the skills of team working and interpersonal communication identified as necessary for the practice of Design for All are added as a separate category on the general, horizontal level; that is, these skills apply to all sectors of design.

Secondly, the identification of learning outcomes, will help to lead the implementors of these results to incorporate Design for All in a way that reflects the important pedagogic trends of

- Constructivism: pondering, exploring, discovering, explaining

- Socratic questioning and dialogue: type and areas of questioning, brainstorming, concept mapping, teacher as facilitator

- Collaborative/Cooperative working relationships: research, discovery based learning, problem based learning, partnership development

- Critical thinking: single focus area, deeper probing

Section 5.4 below lists some of the goals that learners might expect after learning about Design for All. More specific learning outcomes for topics within each category should be formulated according to the context of the course and study programme into which the topics have been integrated.

4   Strategies for Identifying Core Knowledge and Skill Sets

In order to identify the body of knowledge that goes to make up Design for All, three main strategies were followed. The first was to examine current practice, and to build up from offerings an understanding of what areas of knowledge were being taught. This applied to all types of Design for All activity. The second was to examine applications of, and research into, Design for All. The area of online learning proves to be a particularly rich source of input for design for all in the Web based information and online collaboration application areas. These two strategies fed into the third, namely, 'consult the experts'. This was done by presenting in summary form the results of the first two strategies at a workshop specially convened for the purpose, and continued in online discussion and dissemination activities, in order to approve the body of knowledge by consensus. These strategies are discussed in more detail in the subsections below.

4.1   Examining current teaching practice

As outlined in Deliverable 3.1, the current teaching practice in Design for All was examined to understand what was being taught. The first discovery was that the most developed area was that of the built environment, with applications to do with the accessible Web coming second. A brief taste is provided below, a fuller discussion of the results can be found in Deliverable 3.1 section 4.

4.1.1   Built environment

Within the well established courses for built environment it was possible to see that students were being taught about awareness, Design for All rationale and recommendations, they were encouraged to spot bad designs and make suggestions for improvement. Some project work is very elaborate, leading to prototypes of buildings, or areas that are accessible, and sponsored design competitions.

4.1.2   ICT sector

The most prominent courses within ICT were those to do with making the Web accessible. Thanks to both the push from the need for legal compliance in the States with ADA and the inclusion of universal design principles in section 508 on the one hand, the W3C's WAI guidelines, and the availability of various validation tools, on the other, there are many courses, and indeed some of these are online, for learning about this subject. Aside from the technical aspects of these courses, there are components about awareness of the barriers posed by inaccessible design.

4.2   Examining applications and research

4.2.1   On line learning applications

One of the most popular areas of Design for All applications, some focus on making the enabling technology accessible, others on instructional design issues, for instance making sure that the syllabus followed is inclusive. The content yielded by this area provides a rich resource of Design for All content that can be cross related to a number of knowledge categories.

4.2.2   Best practice in public Web sites

One of the most useful resources, Web sites of all types can be used for illustration purposes to demonstrate various topics within knowledge categories, e.g., guidelines for making Web content accessible and usable.

4.2.3   Health monitoring applications

These applications are exemplar in helping students realise the importance of understanding the wider context of user requirements. Those whose condition needs (or would benefit from) constant monitoring present use scenarios that demonstrate clearly the benefits of ICT based systems over existing monitoring systems, provided that user habits, comfort, and privacy are respected.

4.2.4   Pure research issues and challenges

This relates to research work that could have a bearing on Design for All concerns, for instance, research on intelligent and adaptive interfaces. Such applications may be specifically tuned towards a particular experience, such as understanding where a user is within a context (location awareness) and relaying information to him based upon that knowledge. An example is understanding where a visitor is, or what he is looking at and relaying him material relevant to the artefacts he is observing [15]. Such applications can be rendered to offer richer experiences for users, if the relay system knows a user's preferences, e.g. understands one language better than another, prefers one modality (auditory information) over another (text based information), etc.

4.3   Consulting experts

4.3.1   Preliminary taxonomy from scrutiny of existing initiatives, applications and research areas.

The insight gained from the investigation of existing teaching initiatives, as well as relevant applications and related research areas, were collected and organised into a taxonomised body of knowledge. This was presented, along with other contextual information in Deliverable 3.1. "What constitutes Design for All Knowledge?" The original taxonomy was presented as a straight list of categories with examples to explain what areas each category could cover.

4.3.2   Helsinki workshop, Helsinki mailing list

The next part of the work plan involved the organisation of a workshop. This was to cover the needs of workpackage 2, which sought to understand firstly, what are the needs of industry in regard to employing people with Design for All knowledge. It was also for workpackage 3, which shared experiences in teaching for Design for All. In the WP3 part of the brainstorming the participants were invited to examine the proposed taxonomy and try to validate it in the light of their own experiences. As a practical measure, they were asked to add to each category examples of what they would teach or would expect to find in this category.

The work of this part of the workshop was collected in detailed narrative and is presented in section 8 as Appendix 1.

4.3.3   The dialogue continues: further dissemination and feedback

As a result of this brainstorming session, several adjustments were made to the categories. The category on resources was discarded as it is not a body of knowledge to be taught but a collection of useful tools. However, in the brainstorming session the examples people noted have formed a useful list. A new category was added, that of interpersonal skills, with the example of advocating attitude change within organisations. In addition, it was recognised that four of the categories may apply across the range of design sectors as category labels, although the content would need to be changed to fit the particular discipline. Hence under the recommendations category, an architect would find technical specifications for accessible buildings, such as height and incline of wheelchair ramps, whereas a Web site designer would expect the same label to render him guidelines for accessible content.

Other comments related to teaching of the knowledge, and gaining accreditation for courses. Although these are very valid points they were not in the scope of the brainstorming which was to concentrate on the superset of the knowledge sets to be presented to learners.

As is usual with such sessions, the brainstormers ran out of time, and it was agreed to continue the discussion by email. To date there has not been much traffic on the list, in spite of initial interest. Motivating busy people to respond to such debates is a well documented problem [16]. Unless the motivation to participate is strong, or the community is well established, it is normal for the debate to peter out. We will attempt to animate the list with further news of IDCnet's activities and calls to participate in 2nd Workshop.

A further source of encouragement and validation is the establishment and exchange of information with experts who were unable to attend the Helsinki Workshop but asked to be kept informed, as well as offering valuable information about activities that they undertake in Design for All Education. These included key figures involved in HCI Curriculum Recommendations, and in the Universal Design Education Initiative in the United States. They also expressed willingness to collaborate with IDCnet for the Education and Research Policy workpackage (Workpackage 4).

4.3.3.1   Conferences

A traditional means of disseminating the work of a group is via academic papers and conferences. In order to diffuse the results of this work package, conferences have been targeted that address a slightly different audience each time, in order to spread the message to as many sectors of the design community as possible, and not just to the 'converted'.

- Include Conference (Design educators and professionals), 25-28 March 2003, Royal College of Art, London: http://hhrc.rca.ac.uk/events/include2003/index.html

- Tales of the Disappearing Computer; Design Education Session (Designers concerned with Future and Emerging Technologies FET): http://ilios.cti.gr/DCTales/design_education.asp

- ICAT (Researchers in the field of disability, technology and assistive devices), 21-22 May 2003, British Computer Society Disability Group, Derby: http://www.bcs.org/disability/icat/ (note, now postponed to December 2003)

- HCI International Special Session on Design for All in the University Curricula: http://hcii2003.ics.forth.gr/program/Friday.asp

- INTERACT Workshop coordinated by IFIP Working Groups 13.1 on Education in HCI and HCI Curriculum and 13.3 on HCI and Disability, Zurich, 2 September 2003: http://www.interact2003.org

- AAATE (7th European Conference for the Advancement of Assistive Technology in Europe), 31 August-3 September 2003 http://www.atireland.ie/aaate

- ICSID (International Council of Societies of Industrial Designers) Design Educators Conference): http://www.ifdesign.de/inhalt-icsid_educational_callforpapers_d.html

4.3.3.2   Mailing Lists, forums, similar initiatives

Finally, as a result of activity in the area, there are a number of mailing lists where messages are posted to alert members of the existence of IDCnet and its activities and publications, and to invite collaboration, as well as to learn from. These include

- European Design for All e-Accessibility Network (EDeAN[1]) plus its national contact centres.

- Design for All Network of Excellence,[2] (represented at Helsinki Workshop).

- GR-DEAN (University of the Aegean has been designated the moderator of the list for the Curriculum for Design for All task force).

- Universal Design Online.[3]

- Special Interest Group in Inclusive Design for Centre for Education in the Built Environment.[4]

- LTSN Learning and Teaching Support Network.[5]

- Universal Instructional Design discussion at list listserve@listserve.uoguelph.ca

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[1] http://www.eaccessibility.org/

[2] http://www.d4allnet.gr/

[3] http://www.udeducation.org/

[4] http://cebe.cf.ac.uk/learning/sig/inclusive/index.html

[5] http://www.jiscmail.ac.uk/lists/LTSN-GENERIC-CENTRE.html

5   Core Knowledge Sets and Skills

5.1   The taxonomy of core knowledge sets and skills

This section presents the knowledge sets and skills that were derived from the strategies outlined in section 4 above, and structured as a taxonomy formed of 2 main categories, and 9 subcategories, as shown in the table below. Each set corresponds to a subcategory within the taxonomy, and each subcategory may have many topics, with corresponding examples in it.

Table 1. Taxonomy of Design for All knowledge sets and skills

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Design for All: Core Knowledge Sets and Skills

Category: General: applicable to all design disciplines

Subcategories:

1. Design for All Awareness. What is Design for All?

2. Why Design for All: ethical considerations, compliance with legislation, commercial potential

3. Recommendations: Principles, Guidelines, Standards, Best Practice, etc.

4. Interpersonal Skills: effective communication in multidisciplinary design teams

Category: Information and Communications Technologies (ICT) Sector

Subcategories:

1. Accessible content

2. Accessible input and output

3. New paradigms of Interaction, Applications and Research

4. User centred design

5. Application Domains and Research

The categories and subcategories within the taxonomy are meant to be broad enough to endure, although certain topics and examples that fall in each subcategory are time dependent. Such is the nature of the subject, closely linked to advances in technology, that the content of the categories will need continual updating. However, and consistent with other methodologies for shaping curricula recommendations, the basic subcategories for the body of knowledge are defined. Even after scrutiny from wider audience comprising new members of IDCnet, and other

colleagues with experience in the area, the subcategories of the taxonomy have remained stable.

The purpose of the taxonomy is to classify information concerned with DfA so that prospective instructors/ curriculum designers can see at a glance what types of information are involved. At the same time it needs to be wide enough to be applicable in many different areas and forward looking enough to provide for new information to be classified in the existing schema rather than continually create new subcategories.

The taxonomy, by providing this classification system helps other stakeholders to "pigeonhole" information and orientate themselves. This applies to collectors of information, such as researchers and librarians, as well as learners who find it a good road map of where they are and where they want to go, especially when overwhelmed with the large amount of literature and resources on the web.

The taxonomy can be used as a basis for teaching pilots, but not all subcategories may be presented to students, this depends on other factors such as length of course, or module, background of students, perceived needs for expertise, etc.

In brief, whether it be to draw up curricula recommendations, or to organise content for a Design for All course, some understanding of the field and its aims, even if it cannot be called a discipline, is required, and the taxonomy provides the framework for this understanding.

The material in these categories is open to 'breadth versus depth of knowledge' approaches. That is, determining what the student has to be aware of, as opposed to what the student is expected to be able to know well and be able to apply. This cannot be specified in the taxonomy, it is up to individual institutions/ instructors, or in the case of self study, the students themselves, to decide what level of competency in what particular topics is required.

The whole range of subcategories could be used, making the basis of a course. It is particularly suitable for design students, provided they have already had tuition in topics concerned with design processes. A more flexible approach would be to take topics from the sets or categories in a 'mix and match' style to blend into on going courses. This could be done at a module level, or even blended into units, for instance teaching how to code for Braille output, alongside coding for other types of output.

Some sets may diminish in importance, or even fade away over time. This would certainly be the hope for the Awareness category and the Why Design for All category, the idea being that the philosophy of Design for all becomes so well established as part of design that there is no longer a necessity to emphasise it, or to rationalise it. However, if the slowness of related areas like human factors and HCI is any indication, then we shall need these categories for some time to come. At least however, the idea of Design for All as a social value, may progress, especially if, as has been suggested Spanish DfA educationalists, DfA is included in the secondary

school curriculum. On the other hand, the new interaction paradigms set is only bound to grow, in the face of new advances in networked and wireless technology, its pervasiveness and our dependence upon information.

5.2   Category: General: applicable to all design disciplines

The four subcategories in the general category, are, as the category implies, relevant to all design disciplines, including architecture, transport, product design, etc. Within each subcategory, the content could be tailored to specific sectors. Although, of course, for teaching purposes, it is often very useful to make analogies with work from other sectors, for example, the built environment, to illustrate a point, e.g. "An inaccessible web site is like an inaccessible building, it doesn't matter how nice it is inside, if I can't get in." In addition, as boundaries are being broken down between disciplines, it becomes increasingly important for designers of all disciplines to at least be aware of what is happening in other areas. For teaching and curriculum purposes, it is always useful to see how Design for All is being taught in other sectors, and if there are ways to use ideas.

In the subsections that follow, each subcategory is described, giving several examples of the type of knowledge for each , and indicative learning outcomes. Some further examples of topics under each category can be found in both deliverable 3.1, and very briefly in the Appendix to the workshop report (see Section 8).

5.2.1   Awareness of Design for All

This knowledge category serves most often as an introduction to Design for All. By various means students are encouraged to think of users in a wider category than just mirror images of themselves, to understand how barriers are unintentionally put up when user needs are not sufficiently understood.

One of the most valuable tools to use [17] here is to invite guest (disabled) speakers who can describe first hand the problems they face, and perhaps demonstrate some of the technologies that allow them to access ICTs. Failing "live" guests, there are some very instructive short videos available for instructional use, such as those produced by WEBAIM [18], where a blind and a deaf user each demonstrate some of the problems they face, and the tools they use. Also the IDCnet project will make available shortly through its Web site different digital versions of the video "Web sites that Work", produced by the EU, WAI and RNIB.

The important point to get across is that Design for All is not a euphemism for "Design for the Disabled", but design rather for a diversity of users, with a range of abilities, or even for different capabilities. So while practical exercises can be used here, like empathic modelling [19] to simulate some of the effects of aging, or disability, simulation exercises

can also be used to show that 'handicapping situations', such as holding a baby while trying to send an SMS on an unfamiliar mobile phone, can result in failure to accomplish the tasks successfully. (In the class at the Aegean, the rather confident male student who did not believe he would have any problems, not only failed to send the message, he also dropped the 'baby', which fortunately was only a doll!)

Finally another strategy is encouraging students to observe examples of bad design [20]. This can be used as a measure of the success of the awareness exercises, observing how students set about the task of reappraising the world around them, beginning to see obstacles, or possible obstacles, where previously they had not noticed any, or not given any thought to the matter. Typically, the first examples to be brought forward are examples from the built environment such as access to building or transport, and then with devices (public phones, lifts) then bad signage, and gradually, asking themselves as they engage with other ICT products and systems around them, such as the University's online library software, or the online administration system, if these are usable by other types of users.

Experience in the teaching pilots has shown that students, after this first 'awakening', start to flounder with definitions of Design for All. In an effort to reject the "one size fits all" misconception, they begin to think in terms of designing that several alternative solutions for different categories of users is the way to design for all, only to quickly realise that logically this is an unscaleable, unmanageable, and unrealistic solution. In awareness exercises, it is important to emphasise the fact that people do not fall into neat categories. A useful tool to illustrate the notion of design for all is to use the usability pyramid graphic of Nordby [21].
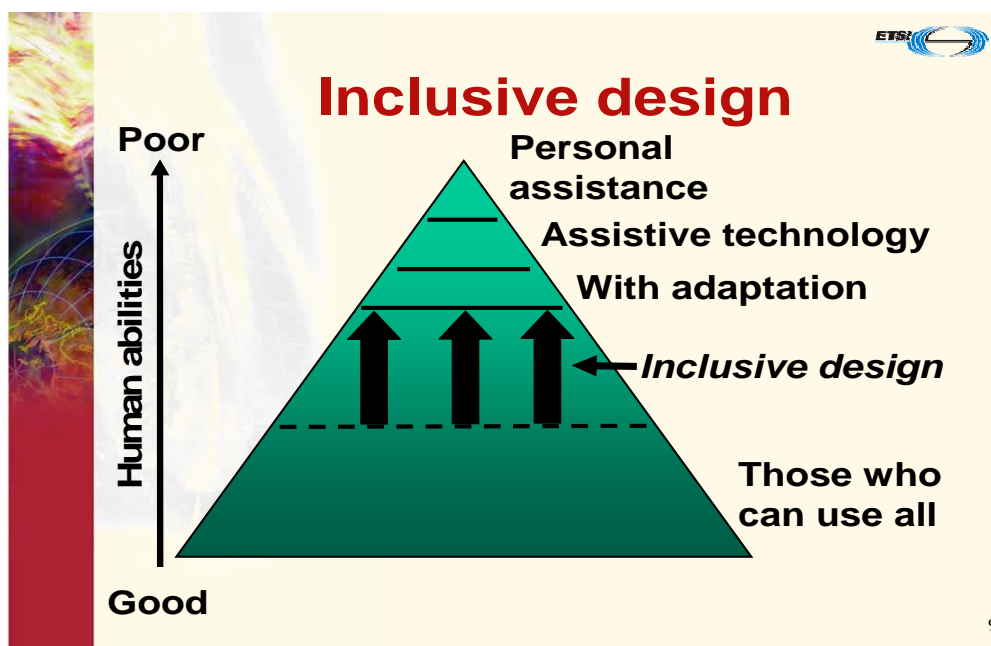

Figure 1. Usability pyramid (Nordby, 2003)

This presents all users of ICT equipment and services as a pyramid with human abilities along the vertical axis, from good at the bottom to very poor at the top. There is a wide base containing those who can access all services and devices directly. Above that is a smaller section containing those who can access equipment and services only with some form of adaptation (e.g. getting up very close to read a display, memorising a sequence of actions, users marking a smartcards to remind them which way to insert them, etc.). Above this is a still smaller section containing those who need some form of assistive technology (e.g. supplementary large display for visually impaired people, special keyboard for blind or motor impaired people, extra amplification for hearing impaired people, etc.) to access equipment and services. At the apex of the pyramid are those people who can only access services and devices with the assistance of another person. The goal of Design for All therefore is to push the boundary between 'Those who can use all' and 'With adaptation' as far up as possible. Put another way, it could be DfA could be understood not as 'one size fits all' but 'one size fits most'.

5.2.1.1   Learning outcomes

Students are made aware of problems faced by users in various contexts, e.g. access to built environment, products and services, to information sources especially the Web. Students understand that Design for All, does not mean one universal solution, ('one size fits all') but the inclusion of accommodations that serve many situations and users, i.e. both those with disabilities and those in handicapping situations. Students are warned from thinking the only way to deal with Design for All is to design for different categories of user, and to focus on capabilities: for example, a device should be capable of withstanding tremor, whether it be caused by the user having Parkinsons or the user using the device on a moving train.

5.2.2   Why Design for All? Ethical, legal and commercial considerations

Under this knowledge subcategory students are introduced to three complementary rationales for Design for All, as given in the subtitle above.

- As part of ethical considerations, students learn about the history of Human Rights, from the 1948 Declaration of Human Rights, through to the Disability movements of the 1960s, to understand, the move from segregation to integration, from specialised solutions to Design for all, that is, inclusive solutions and equal opportunities for all. This is set in the context of emerging world views, where there is a shift away from an emphasis on the individual to a more communal, collaborative approach in which social justice is at least as important as individual well being.

- As part of legal considerations, students learn about various pieces of legislation, how they have come about, their impact, and what is set to happen in the future. It is very important in this area both to emphasise the global nature of the legislation, with laws in force in the US, Canada, Australia, Japan and Europe, as well as to point out local efforts in countries the students are interested in. When dealing with ICT, and e-commerce, globalisation may mean that products and services produced in one country, but available worldwide, may have to conform to different laws. It is also helpful to underline the connection between legislation and standards, with the latter often being the basis for the former. The whole debate underlining the "carrot and stick" approach of current legislation, as well as the problem of legislation being prescriptive can also be part of this content.

- As part of commercial considerations, students are introduced to the commercial benefit of Design for All, and various supporting arguments, such as demographics and the ageing population, the problem of retro-fitting design, etc. An understanding of the notion of corporate social responsibility is also invoked. In today's environment, corporate social responsibility profiles have increasingly become fundamental in building trust and reputation with the clients and consumers companies do business with. In this context, the experience of 'closed doors' can have a negative influence on the way people perceive even the most reliable companies and the strongest brands. Thus companies that display a commitment to Design for All do so because they believe it means a reduced risk of action under disability discrimination legislation, a better corporate image and a greater access to potential markets. Examples of the commercial success of products designed for all, for instance, the OXO range, are also useful to illustrate the points made here.

5.2.2.1   Learning outcomes

Students are made aware of the rationales for Design for All. This helps them to understand the importance of the topic from several angles, and is good motivation. At the same time it enables them to marshal arguments in its favour, and justify its existence on several levels.

5.2.3   Recommendations

This knowledge subcategory is used flexibly for topics such as Principles, Guidelines, Standards, Recommendations, and Specifications that have a bearing on Design for All. In addition, the legislation that uses standards as their basis can also be referred to. As can be expected, there are many, many examples, and a few are given below for illustrative purposes, mostly concentrating on those that have a bearing on ICT

- Principles: The most prominent example are those from the Centre for Universal Design, North Carolina State University [22]. The interesting thing about these was that they were developed by a multidisciplinary team of architects, product designers, engineers and environmental design researchers, to guide a wide range of design disciplines including environments, products, and communications.

- Standards:
  - de jure: ISO DTS 16071: Guidance on accessibility for human-computer interfaces (2000). This draft technical specification (derived from ANSI HFS 200) [23] provides guidelines and recommendations for the design of systems and software that will enable users with disabilities greater accessibility to computer systems (with or without assistive technology). It includes low vision users, hearing impaired users, deaf users, users with physical and cognitive impairments, and the elderly. It is not yet a full standard.

  - de facto: W3C's WAI guidelines [24] are the most clear example of de facto standards. As a way to get to grips with the Web content accessibility guidelines, Automated accessibility checking tools which refer the user back to the recommendations, help to reinforce the use of them and provide a way of motivating students to study the recommendations.

- Guidelines: from companies, such as Microsoft, Sun, IBM, etc. [25] Characteristically these are written in a style that is easier to read than formal standards, they expect their readership to be software engineers, programmers, etc needing easy to pick up practical guidance. Since they also want to promote their company's products, the guidance they provide is not always applicable to other products

- Legal requirements: There are countries like the USA that require the implementation of their own recommendations (see e.g., Section 508[26]). Other countries, like Germany, adapt and modify slightly existing Guidelines like those of WAI (see e.g., German Accessibility decree: Verordnung zur Schaffung barrierefreier Informationstechnik nach dem Behindertengleichstellungsgesetz, Barrierefreie Informationstechnik-Verordnung BITV [27]).

- Recommendations: The CEN/CENELEC Guide 6 [28] The purpose of this document is to be used by a specific audience, that of standards developers, to guide them on how to include Design for All in standards. However, for a short document of 30 pages, it contains very useful information, such as definitions, and helps get an overview of the range of Design for all, by looking at the areas it can

impact on, following the normal format of standards, (e.g. the tables in clause 7).

- Specifications: These are normally lower level descriptions, which are fairly prescriptive, used by engineers, such as the widths and heights of objects, or for software engineering, where they represent the translation of user needs into machine and code requirements. As an example, the Accessibility specifications for the Learner Information Profile, from IMS [29] provide information models, use cases, XML bindings, etc

5.2.3.1   Learning outcomes

Students are made aware that such bodies of knowledge exist, and where to find them. They should be encouraged to search for such work and consult them as a first step, whenever they are set a task.

Students may need to be shown how to make use of these resources. It may be necessary to demonstrate the need for interpretation from the general and abstract to the particular, so that they can use and implement them in specific contexts. Several other points about the use of recommendations may also need to be made. The 'jargon' of each type of recommendation is a consideration, as is the difference between a formal standard, backed by an accredited standards body, compared with a informal set of "rules of thumb". The terms "recommendations", "specifications' and "guidelines" are used in various ways. Students need to understand what can be seen as authoritative and validated, and what is less so. Currency is another issue. A de jure standard may become outdated quicker than a de facto one, simply because the process for formal standards tends to be lengthy, while technical standards, because of the advances in technology are liable to become outdated, so the most recent version should be sought.

As students are engaged on learning about, or carrying out tasks in, for instance, accessible content, the guidelines referring to this could be invoked. Given the interest of industry in standards and legislation, for students engaged in a course of continuing professional development, this subcategory will probably be of more interest than to the typical undergraduate. Most in-house training for corporate professionals is done using the guidelines provided by their own companies. The issue of interoperability and to open source work needs to be seen in the context of design for all, that is not locking people into one supplier.

5.2.4   Interpersonal Skills for Teamwork and Communication

This category is slightly different from the preceding ones because it centres on skills rather than on knowledge. These are mainly behavioural skills such as team work, communication skills, information representation, information retrieval, etc. and are recognised as being

very important to interdisciplinary ICT based work practice [30]. There are several studies, both in teaching literature and in business practice noting the increasing importance of "soft skills".

However, many of the techniques used in these soft skills to not explicitly pay any attention to Design for All, although they could be very useful. To describe some of these techniques, it is necessary to refer to the actual teaching strategies that are the most useful way to give students the opportunity to learn these skills, e.g. organising team projects, presentations and critical evaluations (critiques).

Students must be encouraged to make sure that they adhere to the principles of design for all, even in their presentation material. For instance, they are asked to think more carefully about colour and layout of the slides, imagining that they must cater for those who are visually impaired or are sitting too far back in the auditorium to be able to see. By the same token, if they use diagrams or images, they should refer to them, briefly describing them.

They should take care to face their audience and enunciate clearly, this is important for lip readers, for signers, but also to people listening to a language that is not their mother tongue, as well as to those who reinforce their understanding with facial gestures and body language. They should maintain coordination between what is projected visually and what they are saying.

Other ways students may experiment is with using tools that read aloud slides (primarily for use by presenters with a vocal impediment, used by one student recovering from an operation and needing to minimise the use of her voice). Other materials, like videos, should ideally be captioned. At the very least, they need to be explained and described by the presenter.

Paying attention to their communication style in the sense of really thinking about the actual and potential needs of their audience, helps students generally with these soft skills. For instance, they scan the audience to see if there are any obvious problems in terms of lighting and acoustics, they make sure not to stand in front of the projector, or obscure it during their presentation, etc.

Other techniques include those for dealing with critiques. When a question is asked from the floor the question should be repeated for the benefit of the whole audience. This should be standard practice, but even more necessary if the questioner has a speech defect, or bad command of the language, that may impede other listeners understanding.

Besides presentation materials, students can be encouraged to submit their written work in digital formats that allows it to be made accessible to different modalities, for instance in easily convertible code.

Finally, within a work context these skills can be used to good effect to help to convince colleagues and superiors of the importance of including Design for All.

5.2.4.1   Learning outcomes

Students are made aware of the existence of these skills, their importance to the workplace, and to Design for All, and that they should themselves make sure of good DfA practice.

5.3   Category: Information and Communications Technologies (ICT) Sector

5.3.1   Accessible content: knowledge about documents and multimedia

As its label implies, this subcategory refers to ways of ensuring the that 'content', mostly the type of e-content found on information and interactive Web sites, is accessible to all. This category is perhaps the one most often used for courses on web accessibility, which uses the WAI guidelines as their basis. However, there is other information and knowledge to do with accessible content that is also very useful. For instance there are several sources of information to be found in various communication studies dealing with literacy, with dyslexia, with how people read on screen, as opposed to on paper, that are all also useful.

Topics can include:

- making content understandable in the sense of legibility and ease of comprehension. That is, for text, writing clearly and simply, using summaries, etc., and providing text equivalents for non text information. For other media, making sure that media equivalents, usually captions for audio material, and audio descriptions for visual material (images, graphs, videos, etc) are available. There are also other techniques, for simplifying the message of content, from using different colours, to small sketches. As with all Design for All, it is important not to focus on one user group, and exclude others.

- making content accessible in the sense of structuring (multimedia) documents, by using metadata, style sheets, headings, and other presentation techniques, etc.

- making content accessible in the sense of content management and use: easing navigation and interaction by being consistent throughout the content, and, as far as possible, ensuring predictable responses to user actions

From this subcategory, the material can be studied at the theoretical level, understanding perception and comprehension of different types of

content, including findings from literary analysis to cinematography, and also at the practical "how to" level. It can apply to students who are Web designers with training in information and communication design, or web designers whose background is in pure computer science. Topics and their related objectives can become more specific, for instance, learning how to code for accessibility using different technologies The next deliverable, on the teaching pilots, will report on several ways of teaching this topics from this subcategory, such as a practical exercise in captioning a video, using SMIL, coding for Braille output, using automatic checkers, etc.

5.3.1.1   Learning outcomes

Students develop the ability to understand when content is problematic and why. They learn about current methods and techniques to produce accessible content, or to convert content. Depending upon type of student/ course, they develop to varying degrees the ability to create or aid in creating accessible content/ convert or aid in converting content.

5.3.2   Accessible interaction: input and output

This label is subtitled input and output to help to explicate this subcategory. It is defined as the hardware and software enablement of interaction. As assistive technologies, many of these devices are unknown to students. Yet as part of everyday device functionality, they accept features on their mobile phones like vibrating alerts and flashing lights, or a whole range of remote controlled devices. All these were originally belong to specialist technology, now all mainstream. How users make use of these alternatives provide insight into human abilities and inspiration for use in products designed for the majority

Topics here would include:

- Typology of different types of devices. Knowledge about assistive and adaptive devices that enable alternative input and output, e.g. speech synthesizers, screen reader software, screen magnifiers, alternative keyboards, etc., as well as different types of software, browsers and operating systems that allow manipulation of the content, etc. Knowing something about how these technologies work, both helps students to understand why content must be accessible to them, and also to avoid some of the common sense mistakes, that come if guidelines are followed without knowledge of the reasoning behind the recommendation. For instance, the layout of the web page that is not correctly structured for the user to tab through it. Students, having had experience of these technologies, are better able to appreciate that there are still problems with the use of these technologies. As a random example, speech synthesizers can still be very difficult to understand, and can make "mistakes" if they are presented with text that is an abbreviation, or

in a foreign language (it will try to pronounce them as ordinary words in the language it is set up for).

- Knowledge about different types of modalities: speech, haptics, gesture, sketch, pointing, scanning, word prediction, voice input bio-sensors, etc. When we talk of multimodal interaction, we do not always appreciate that some of these at present more unusual input modes may soon become our habitual way of interacting with certain devices and services. Each modality may both include and exclude users. Thus a combination of modalities, or a choice between a combination is offered, helps design for All. The downsides of this are the technical problems of bandwidth and synchronisation of the data streams.

- Knowledge about different bandwidths, device capabilities, etc. At the lower end of the technical spectrum, it is important to remember that accessibility also refers to things like how much bandwidth there is available. Unless these factors are taken into account, accessibility will be violated, waiting for a download of a SMIL file, or expecting to read a web page on a mobile phone screen.

5.3.2.1   Learning outcomes

Students are introduced to a range of different input and output modalities, devices that support them, and technical considerations. As with other categories, depending upon the specific course objectives and the background of the students, the material can range from "knowledgeable about" to "knowing how to"—that is, competent to talk about these topics; understanding at a general level how they function; to being able to actually develop and/or working on developments based upon them. In each case, the input and output is accessible in so far as it helps greater numbers of people to interact with the products and systems.

5.3.3   New paradigms of interaction

This subcategory was created as a 'catch all' for the work that is mostly in research state currently, but within the next five years —the typical time span of an undergraduate+master's university education— could breakthrough into mainstream development.

It is an important subcategory to have because it introduces students to the leading edge research in the area, research that often helps to keep Design for All on the agenda in Universities. Topics that can be distinguished are affective and social computing, a range of smart computing applications, such as smart homes, wearable computing (clothes and accessories) in vehicle telematic systems, pervasive and mobile computing, ambient intelligence, etc. Do these areas always incorporate a Design for All dimension. Not always, but many have their

roots in inclusive design, such as smart homes for independent living, wearable computing to monitor vital life signs in infants at risk, and Fiat's in-car telematic systems research aimed at elderly users.

Another possible example is that of Digital TV. At the present time, there is much debate on digital TV, and its potential use as a web access device for interactive services. The thinking is that it will help to include users who are presently excluded because of economic reasons, or because they are not computer literate, or both. It is being spoken of as a tool for e-inclusion, the first steps are being taken by CENELEC [30] to try to ensure interoperability of the systems, the debate about what it might mean to users has just begun.

5.3.3.1   Learning outcomes

Students become familiar with the emerging paradigms, understanding how they have evolved from current work. Further specialisation depends upon both the background of the students, and degree of emergence of the paradigm. In each case, students must be encouraged to view these developments through the "lens" of Design for All, to discourage new technology being developed that is exclusive.

5.3.4   User centred design

This category is the one into which go all the human, user, usability/accessibility philosophies, methodologies, techniques that apply to requirements and evaluation phases of design, etc. Many of these are routinely taught as part of HCI courses, but as they are currently used they do not always include diversity in users and situations.

This means that some methodologies will not be suitable for some users, and others will need some rethinking to make them so. Special accommodations that have to be made when including a diversity of users in the user-centred design lifecycle relate to practical issues about how to deal with disabled/elderly users. For instance, how to elicit rating scales from very elderly people, how to do a concurrent or retrospective verbal protocol with a blind person (in the first instance, if they are using speech synthesis, the design of the elicitation should ensure that the subjects don't talk over the speech; in the second instance, all interaction needs to be described to the subjects, which is not very easy, nor productive). Some users cannot be considered for verbal protocols because of difficulties with cognitive or physiological disorders that prevent them responding.

Some of the problems relate to the nature of the methodologies themselves: for some time past, one of the prevailing methods of doing comparative user studies was to group subjects according to user characteristics – such as novice /experienced users. However, for design for all, it is not useful to think in dichotomies, young/old, disabled/non

disabled users. Instead there is a continuum of abilities on various dimensions.

Again, over focusing on one disability (the blind) might lead to design that favours one disability while causing new problems for other disabilities.

As people age, their abilities decrease, but they are not always aware of this, as they can compensate in many ways, especially if supported by technological design. Thus in this case, older people may not accurately judge their abilities.

Another important issue in using user-centred design with disabled and elderly people is the evidence of very strong "demand characteristics" -a phenomenon well known in psychological research-, where subjects give designers what they think they want to hear. Techniques that can get round such problems need to be devised, or different methods used.

It is also necessary to be sensitive to the unstated needs of users. There are many examples past and present of devices that fulfill technical requirements with the functionality that was needed, but are so displeasing aesthetically, or worse, stigmatise their owners, to the point that they will choose not to use them. Obtrusive hearing aids, and lately, the loop, can be cited as examples.

What distinguishes Design for All from human-centred design is that students have to put more effort into understanding users needs, and not think that they do. For instance, when asked, most students felt that the deaf community has no problem with text, and would be adequately compensated with systems that provided them text equivalents. They did not appreciate that this is the case mostly for those who went deaf later in life, and that for those who are born deaf, or are deaf from an early age, the chances are that their schooling will have enabled them to attain reading skills that are not much beyond elementary school level. Assumptions about user abilities need to be supported, or disproved. To aid in this task there are many sources that describe the functional aspects of various impairments and disabilities [31].

5.3.4.1   Learning outcomes

Students are made aware of the work in this area, the methods and tools available, and are alerted to the fact that some accommodations need to be made, and workarounds found, when a wide diversity of user capabilities is being put at the centre of the design process. The benefits of this approach are that the design concepts will be stressed to the limit, at an early stage, allowing the design team to rethink misconceptions and parts of the design they had taken for granted.

5.3.5   Application Domains and Research

This label can refer to 'application domains', and separately to research issues and challenges that go with them, or it can view these two activities as related, dependent upon the case.

This subcategory has a wealth of domains, such as public access to information, authoring environments, health monitoring, and leisure activities, (online games) etc. An application domain of much concern at the moment is that of eGovernment, and with understanding that 'traditional' government services will eventually be phased out it is important that every one has access to these services, and that the services themselves are accessible and usable.

However, by far and away, the area where the most work has been done, bringing with it important contributions to the whole area of Design for All, as well as results that can be used in other application domains, is that of online learning, and for this reason is it described in more detail below.

5.3.5.1   Learning outcomes

Studying Design for All in a specific application domain within the ICT sector offers a means to help students move from abstract to focused examples of use. Domains of application may be used as the basis for students to do project work. This allows them to consolidate knowledge acquired from other subcategories of the taxonomy.

5.3.6   eLearning

The education sector, and in particular the higher education e-learning sector is well advanced in its considerations of what it means to have accessible e-learning. It is in this domain that one finds courses built around Web technologies, making content accessible and making interaction accessible. Typically the development of accessible instructional materials is a distributed process, where course materials are a combination of instructor created materials, including assessment/evaluation materials (tests and quizzes); existing materials that an instructor links to; and the organisational and evaluation capabilities of some course management tool. In addition, classroom collaborative activity is simulated by some kind of synchronous or asynchronous conferencing system. Thus within this application domain, much work deals with issues of accessible content and accessible collaboration is being pioneered here.

5.3.6.1   Learning outcomes

Two possible scenarios are described.

1. An application domain as rich as that described above can be used as a guiding framework for students following a series of modules on Design for All. Thus, knowledge from the other subcategories of the taxonomy will always be presented within the context of e-learning.

2. Another approach is to use the background of the e learning domain to help to narrow down specific parts of the overall problem space. For instance, for accessible input and output students might frame the problem by thinking about assessment exercises in particular. What are the current practices, do they pose any particular problems for people using with 'non-standard' access. Unless the exercises are multiple choice, requiring a simple form of input, then timed assessments will be unfavourable to those whose input speeds are very slow. Students can examine research in the area, as well as build upon it to devise improved solutions.

5.4   Overall instructional goals and learning outcomes

As a further guide to the content of Design for All curricula, the following overall instructional goals are offered. Educators can use a variety of topics, combined in ways that suit them, to meet these goals.

The goals themselves are based upon what appears in current taught courses as objectives, and what was expressed in various ways (either in presentations, discussion of presentations, or brainstorming sessions) by the participants at the workshop.

Learners who have followed courses on Design for All should be able to:

- Work as part of a team to develop and deliver executable artefacts.

- Understand the importance of determining client needs.

- Know how to use various techniques and methods to capture user requirements, not just in how they might relate to the product or service to be developed, but also in terms of their needs and abilities, their wants, desires and habits in general.

- Be able to translate information and observation into user requirements with the help of other professionals, in the context of a multidisciplinary team and translating them to software requirements.

- Be able to help reconcile conflicting objectives, finding acceptable compromises within limitations of cost, time, knowledge, existing systems, and organizations.

- Help to design appropriate solutions in one or more application domains using approaches that integrate ethical, social, legal, and economic concerns.

- Understand and be able to apply current principles, recommendations, standards, as well as techniques that are part of

the Design for All body of knowledge in design, development, implementation and verification activities.

- Negotiate, work effectively, provide leadership where necessary, and communicate well with stakeholders in a typical design development environment.

- Be able to add to their knowledge base about Design for All as new models, techniques, and technologies emerge.

6 Conclusions and Next Steps

6.1   Practise what you preach: teaching Design for All

In order to progress further with the work on content definition for curricula recommendations, the next part of the work package foresees the establishment of teaching pilots, to be undertaken at various institutions, associated to members of IDCnet. In most cases, these are not seen as whole courses, but as modules inserted into existing courses, or even topics within existing modules. This is partly because of the difficulty of introducing institution wise, new courses, and partly because the overall understanding is that Design for All is not, and should not be a discipline in its own right, but a horizontal action, that crosses boundaries, and that can most usefully be included within established courses.

6.2   Setting up teaching pilots

Teaching is presently ongoing, and/or negotiations are underway in the following. Of special note here is the European dimension to the teaching, so that material is both European wide, and yet tuned to diverse educational cultures that continue to prevail in Europe:

- Department of Product and Systems Design Engineering, University of the Aegean, on 'awareness', 'why Design for All' and 'recommendations', and laboratory work on 'accessible content', possible seminars on 'new paradigms of interaction'.

- Department of information and Telecommunication Systems, University of the Aegean, on 'awareness', 'why Design for All' and 'recommendations'.

- Department of Cultural Technology, University of the Aegean, on awareness', 'why Design for All' and 'recommendations' and 'accessible content'.

- Department of Computer Science, University of Cyprus, seminar on 'awareness', 'why Design for All' and some 'recommendations'.

- The Abo Akademi, and Turku University, Finland, postgraduate HCI course on awareness', 'why Design for All and 'recommendations' possibly as a series of online seminars, with projects to be completed by the students at the end of the semester demonstrating the use of Design for All.

- Department of Human Sciences, Loughborough University, on 'awareness', 'why Design for All', 'recommendations', user-centred design, and 'interpersonal skills for teamwork'.

- Department of Computer Science, Loughborough University, on 'awareness', 'why Design for All', 'recommendations', and introduction to 'accessible content' and 'accessible interaction'.

- Department of Electronic and Electrical Engineering, Loughborough University, possibly a seminar on 'awareness', 'why Design for All', and 'recommendations'.

- Department of Design and Technology, Loughborough University, 'awareness', 'why Design for All', and 'recommendations'.

- The Research group on Document Architectures at Katholieke Universiteit Leuven is promoting the inclusion of ICT related items in the DfA courses taught at PHL (Provinciale Hogeschool Limburg) by prof. Froyen. The ICT-related subjects in these courses fit mainly in the categories "Recommendations" and "Accessible Content".

- The Research group on Document Architectures at Katholieke Universiteit Leuven has been asked to take responsibility for promoting DfA items in the field of ICT accessibility within the framework of the newly established Belgian branch of eDeAN (BDfAN, http://www.bdfan.be/). On May 15, 2003, a national workshop was organised. The most relevant categories here are "Why DfA?" and "Accessible Content".

- The Fraunhofer Institute for Applied Information Technology is pursuing the inclusion of some Design for All modules in the following semester of the Master's Program in Media Informatics of the Bonn IT Center. FIT is also preparing a post-graduate pilot with the Bioengineering and Telemedicine Group of the Polytechnic University of Madrid in October. The topic will be Advanced Issues on ICT and Accessibility, and the audience will be Computer Scientists and Engineers. The relevant categories from the core sets to be taught are: 'Why Design for All?', 'Accessible content', 'Accessible interaction' and 'New paradigms of interaction'.

- Department of Developmental and Educational Psychology of the University of Valencia Estudi General has offered an optional module on 'Design for All and Accessible Technology' to students of technical courses (Computer Science, Electrical Engineering, Physics, ...). The module includes material on 'awareness', 'why Design for All', 'recommendations', 'accessible interaction' and 'accessible content', this last one centred on accessible web design and video captioning using SMIL and RealText. Next academic year this optional module will be offered by the Computer Science Department.

The progress of these pilots will be reported on in deliverable 3.3. The aim of these pilots is both to demonstrate the robustness of the knowledge sets and skills, as well as to understand what needs to be done to introduce these topics into courses in a permanent way. The obstacles and problems, constructive ways to tackle them, and recommendations for

their incorporation will provide input to the WP4, the work package on education and research policy strategies.

7 References

1. eEurope (24/24th March 2000, available at: http://europa.eu.int/information_society/eeurope/news_library/pdf_files/initiative_en.pdf see p.13)

2. Design Council: http://www.designcouncil.info/inclusivedesign/

3. University Staff Development Programme - Witzenhausen (UNISTAFF, http://www.wiz.uni-kassel.de/trop/publica/report2.html)

4. Light, G. and Cox, R. (2001). Learning and Teaching in Higher Education. Sage Publications, London.

5. Curriculum Design from the Learning and Teaching Support Network: http://www.ltsn.ac.uk/genericcentre/index.asp?id=16893&

6. Toohey, S. (1999). Designing courses for Higher Education, Open University Press.

7. For explanation of SEEK Software Engineering Education Knowledge, see http://sites.computer.org/ccse/

8. Hutchings, T and Saunders, D. (2001). Curriculum methodology: A case study in large-scale curriculum development Active Learning in Higher Education. Volume 02 Issue 02 - 1 December 2001

9. ERASMUS Curriculum Development Projects: http://europa.eu.int/comm/education/erasmus/curriculum_en.html

10. Klemperer, A. and van der Wende, M. Erasmus Curriculum development projects, in Socrates 2000 Evaluation study 23.10.2001 http://europa.eu.int/comm/education/evaluation/soc7.pdf

11. Jones, B.F., Palinscar, A.S., Ogle, D.S., & Carr, E.G. (1987). Learning and thinking. In *Strategic teaching and learning: cognitive instruction in the content areas* (pp. 3-32). Alexandria, VA: Association for Supervision and Curriculum Development.

12. Tinzmann, M.B., Jones, B.F., Fennimore, T.F., Bakker, J., Fine, C., & Pierce, J. (1990). *What is the collaborative classroom?* Available at: http://www.ncrel.org/sdrs/areas/rpl_esys/collab.htm

13. D'Andrea, V-M (1999) Organizing Teaching and Learning. In Fry H, Ketteridge S and Marshall S (eds). A Handbook for Teaching and Learning in Higher Education, Kogan

14. Lublin, J. Curriculum Design Issues from University College Dublin, Centre for Teaching and Learning: http://www.ucd.ie/~teaching/good/cou3.htm

15. ARCHEOGUIDE: http://archeoguide.intranet.gr/project.htm

16. Preece, J. Online Communities: Designing Usability, Supporting Sociability, Wiley 2000

17. Romero, R. and Alcantud, F. A pilot experience teaching Design for All as an optiional model in ICT related courses at the University of Valencia proceedings of mICTE2003: Second International Meeting on Multimedia and ICTs in Education, Badajoz, Spain, December 2003

18. WebAIM http://www.webaim.org/

19. Nicolle, C. and Maguire, M. Emphatic Modelling in Teaching Design for All, to appear in Proceeding of HCI International 2003, Crete June 22-27, 2003

20. Story, M.F. Special Topics on Universal Design: http://www.udeducation.org/teach/course_outlines/courses_focus/story.asp

21. Nordby, K (2003) Design for All Shaping the end-users' Tel-*e*Europe: ETSI's involvement in laying the foundation for an all-inclusive *e*Europe, online at http://www.etsi.org/cce/proceedings/6_2.htm

22. Universal Design Principles, v.2 from 1997 http://www.design.ncsu.edu:8120/cud/univ_design/principles/udprinciples.htm

23. ISO DTS 16071: Guidance on accessibility for human-computer interfaces (2000) for information see: http://www.usability.serco.com/trump/resources/standards.htm

24. WAI Guidelines Web Content Accessibility Guidelines (WCAG): http://www.w3.org/TR/WCAG10/.

25. IBM http://www-3.ibm.com/able/accessweb.html,

26. Section 508 http://www.section508.gov/

27. German Accessibility decree: Verordnung zur Schaffung barrierefreier Informationstechnik nach dem Behindertengleichstellungsgesetz, Barrierefreie Informationstechnik-Verordnung BITV http://www.behindertenbeauftragter.de/gesetzgebung/behindertengleichstellungsgesetz/rechtsverordnung/rvo11bgg

28. CENELEC CEN/CENELEC Guide 6 Guidelines for standards developers to address the needs of olderpersons and persons with disabilities http://www.ibn.be/cencenelecguide6.pdfhttp://www.ibn.be/cencenelecguide6.pdf

29. IMS Global Learning Consortium http://www.imsglobal.org/accessibility/index.cfm

30. Career Space: Curriculum Development Guidelines. Available at: http://www.careerspace.com/

31. TV for All _ Final Report, November 2003 http://www.cenelec.org/NR/rdonlyres/5C6E5124-6034-422A-A1CC-62B2229746C3/664/FinalreportTVforAll.pdf

32. ICIDH-2 International Classification of Functioning, Disability and Health from World Health Organisation for information see http://www.deakin.edu.au/tedca/ncet/information/resources/icidh.html

8 Appendix: Report from 2nd day of Helsinki Workshop

Design for All Curriculum: towards a synergy of the needs of ICT industry and education

1st IDCnet Workshop - Saturday 15th February 2003

Authors: Lilian Henze, Päivi Tahkokallio

8.1   Objectives

The main objective of the workshop was to bring together Industry and Education to:

- Identify needs of industry and future technology landscapes and the resultant requirements for graduate profiles,
- identify knowledge sets and skills that should be part of a curriculum for DfA in ICT.

On the first day of the workshop the focus was on the industrial perspective (see report from the 1st day of the workshop) and some insight in the diversity of ICT industry and was gained.

The second day focused on the 'educational perspective'. Although 'Industry' will be the 'end user' of the graduates (the 'product' of ICT education), the educators will be the main users of the curriculum modules to be developed.

This leads to another objective of this workshop: understanding the diversity of ICT design education cultures.

The practical aim of the second day of the Helsinki workshop was to create the report: *Identifying Core Knowledge and Skill sets for DfA curricula.*

8.2   Presentations

Sum up previous session (Jim Sandhu)

The presentations and discussions of the first day lead to the following insights related to education:

- Many DfA initiatives in Industry are related to 'disability' issues; awareness of 'diversity' is a must.

- Knowledge and understanding of user needs and usability evaluation is crucial.
  Qualities required are: flexibility of approach, emotional intelligence, empathy, social awareness, open attitudes, networking skills, inter-disciplinary skills, awareness of designers' responsibilities in team work.

- DfA should be integrated in all general curricula, not only technical and engineering but also business administration etc.

- Designers should ask the right questions to create useful and effective project   briefs.
  Eliminate compartmentalisation in all DfA issues.

- The 'Battle Field of DfA' for industry can be a threat to education: incompatible terminology and definitions, different regulations, inconsistent standardisation, contradictory guidelines, unnecessary certification.

Academia Session: Intro (Jenny Darzentas)

All participants had received beforehand the report D3.1.1 What constitutes DfA knowledge?

In her introduction of this day Jenny Darzentas outlined briefly the contents of the report.

Teaching DfA in HCI (Julio Abascal)

Julio started his presentation with the discussion on 'what is design for all?'. He visualised the discussion with the following images:
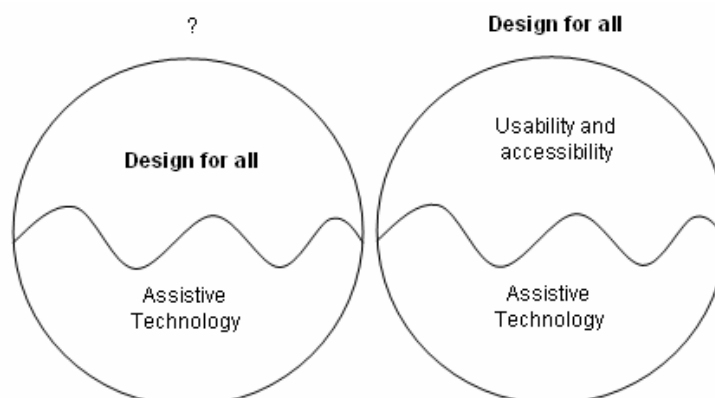
Figure 2. What is Design for All (Abascal, 2003)

In his practice of teaching design for all he prefers to use the right image as a definition.

He defined the following needs to teach DfA in Human Computer Interaction:

- Inclusive Design Guidelines (example: WAI guidelines)

- Sound User-Centred Methodologies (example: USERfit)

- Adequate tools (example: www.sc.ehu.es/userfit_tool)

In his conclusions Julio stressed the importance of starting teaching DfA at an undergraduate level, that it is crucial to have a practical tool and that students should be motivated.

DfA at the University of Namur (Monique Noirhomme-Fraiture)

In her presentation Monique explained how the education at the Computer Science Faculty of the University of Namur was organised. Although there was no dedicated course on Design for All there was an 30 hrs. obligatory course on Human Computer Interaction. Some students take up the DfA field in their thesis work. In the description of the HCI course she made us understand that Design for All is included in Usability principles and guidelines (see www.info.fundp.ac.be/saphir/saphV02).

Monique finished her presentation with a critical remark on the poor attendance of designers in relevant workshops of the Working Group HCI and Disability of the International Federation for Information Processing (IFIP WG 13.3). This has lead to the conclusions that accessibility should be included in the training of designers and a more interdisciplinary activity between IFIP working groups is necessary.

She announced the International conference on Human-Computer Interaction in September 03 in Zurich: Interact'03.

DfA in the Jyväskylä Polytechnic. (Juha Hautanen)

(presentation not available)

DfA – the view from Delft (Johan Molenbroek)

Johan elaborated on the education on Ergonomics in Delft University in the Netherlands. Ergonomics is mainly educated at the Faculty of Industrial Design, not surprisingly, knowing that the mission of this faculty is 'creating products for people'. Not only are ergonomic courses obligatory in first, second and fourth year of the study (theory and practice courses of 140 – 160 hrs), ergonomics is also integrated in the student projects.

Additional elective courses can be done; DfA is one of the 10 possible courses.

Design for All is subject in student projects, graduation projects and university projects.

Only recently ergonomics is introduced at the Faculty of Architecture, a breakthrough in a culture so much focused on shape and material.

Learning units on DfA for computer science students (Gerhard Weber)

At the Multimedia Campus of the University of Kiel, DfA is integrated in the Computer Science curriculum learning units Technical Computer Science, Theoretical CS and Applied CS. Gerhard showed some interesting examples of each learning unit like speech processing and force feedback in Technical CS, braille code as a binary code in Theoretical CS, a database with dictionary design for sign language in Applied CS. He shared his enthusiasm for the possibilities in nomadic teaching and nomadic eLearning.

In his conclusions he stated that a multi-dimensional approach was required to stimulate the process of introducing DfA, resources should be provided to other disciplines in your field and processes should be visible.

DfA in the City University London (Helen Petrie)

At the City University of London has a tradition of disability related research. Helen showed in her presentation how development of education in DfA and eAccessibilty should be possible built on this commitment. The Centre for HCI Design, where Helen is working, provides teaching support in HCI, including DfA and eAccessibility.

She preferred to reach the broadest range of students with some knowledge of DfA instead of teaching an advanced course. This led to teaching undergraduates, more advanced undergraduates and master level courses on HCI. In her conclusions she proposed a level of professionalism to be reached with DfA education:

- Every computing graduate should be aware of the concept of DfA and the rights of older/disabled users.

- Every graduate who has specialised in HCI should understand the basics of DfA.

- Only those who have specialised in DfA should have a full understanding of all issues and methodologies.

Besides the importance of ensuring that DfA is considered a core skill of all computing students at the level of School Policy, she stressed the importance of ensuring that DfA is part of the core curriculum at the level of professional bodies.

DfA in the Technical University of Stockholm (Frederik Winberg)

(presentation not available)

8.3   Brainstorm and Round Table discussion

Main objective of the brainstorm was to identify/validate categories for producing modules and courses in DfA. 'Key knowledge and skill sets'

Categories proposed in the baseline document [D3.1 chapter 5: Content of Courses] were written on flip charts and white board to have a reasonable starting point for the brainstorming session

The categories can be divided in two groups. Categories 1 – 3 (awareness raising / why DfA / recommendation (legislation, guidelines)) are more horizontal, valid independent of the field of Design for All [built environment, product design , ICT etc] in the course. Categories 4 – 9 (knowledge on accessible contents / knowledge on accessible interfaces / new paradigms of interaction / usability studies, HCI, user-centred design, evaluation methods / ICT application areas / useful sources) are more directly connected to ICT education.

An extra flip chart for categories 'not identified yet' was also made available for participants in the brainstorming session.

In order to get insight in the practical value of the categories (which do hold, which should be combined, which should be broken down, which should be removed etc.), a team method to produce ideas was used. Participants were asked to discuss in small groups (2 – 4 people) and to write down examples, within each category, of what they would teach (or already teach) to their students.

The results of this exercise are attached in an appendix.

In the following discussion the following topics were touched:

Remarks on the brainstorm process:

- An explanation about categories was forgotten by start of the brainstorming.

- People with disabilities tend to be spoken about instead of spoken to or listened to (Geoff B).

- Our group used an iterative process, going back and forth: skipping a question when a question was not clear (Bryan B).

- In an optimal situation each group should have a facilitator to facilitate the brainstorm process.

Question: was it easy to find examples?

Answers/discussion:

- It was too difficult to 'open' the categories, and understand what was needed as examples.

- The categories 4/5 were difficult because of the use of the term 'knowledge'. It depends on the level of education you are talking about; "knowledge on accessible contents": what level do you mean? (Monique N-F). Change to "accessible content requirements" and "accessible interaction requirements" (Jim S); on the other hand, the confusion about 'knowledge' is more beneficial to brainstorming (John D);

- "Useful sources" was the easiest category; giving examples for other categories would have been useful (Johan M.); giving examples is tricky (Päivi); put 'knowledge' in front of it and it becomes confusing (Jim S)

- Easiest are the things you think you have most expertise in, but the expertise you have, affects the categorization.

Question: why are there so different types of examples in categories 1,2 and 3 ?

Answers/discussion:

- Two types of things going on under categories 1 and 2; confusion not surprising: originally one category; we want superset of knowledge, make sure nothing gets left out (Jenny D);

- First 3 categories (awareness raising, why DfA, Recommendations etc): relevant to all fields of DfA education >
- How to manage changes in 'users' and 'regulations' ?

Question: next steps?

Answers/discussion:

- I still miss the design process: how to develop new technology -> could be a new category (Lilian); also methods of teaching are missing (Gunnar F);
- It is very hard to talk about knowledge out of a teaching context; but the point is, is everything you want to teach in one of these categories, and if not, what new category should be added (Jenny D.)
- 'how to cope with stigmatisation' is missing, e.g.27 y old needs walking stick that doesn't look like one for elderly persons (Johan M.)
- Few innovative thoughts, e.g. what way is technology going & how do we control technology to make it universally accessible (Geoff B); categorisation of knowledge for curriculum for DfA could come up in next step, cf. 'new paradigms' (Päivi T.); innovation here is that we gather this information for a purpose: find how to educate (John Darzentas)
- Jim S: Validation of the curriculum should be a next step. But what is 'quality' of a curriculum? We're still long away of validation/evaluation (Jenny D).

The Brainstorm session and round table discussions made it clear, that this workshop was only a starting point of a process that needs to be continued. As some participants said: 'this is clearly an iterative process'.

Discussion on the possible categories continues via email to produce a second round of categories analysed [an applied Delphi method]. The email list is hosted by the Catholic University in Leuven, address helsinki@listserv.cc.kuleuven.ac.be.

8.4   Conclusions

Meeting the workshop's objectives

- The first round of testing the relevance of categories proposed in the baseline document, in the Helsinki brainstorming session, showed, that they seem relevant from the point of view that it is possible to produce examples to describe all of them. This alone does not show at all though, that exactly these categories are a valid basis for DfA content production. A conclusion therefore was, that the discussion needs to be continued, and an email discussion list was agreed to be established.

- Conclusions from the session remain sketchy, summing up type conclusions without real links between needs and relevant skills and knowledge.

- It needs to be kept in mind, that the starting point of the second day brainstorming was based on the categories of the baseline document, and this proposal was created before the workshop on industry needs [Helsinki workshop, day 1]

- This means it remains the challenge of the IDCnet project relevant work packages to come up with conclusions that put together results from both industry needs analysis and identification of core skills and knowledge to produce content for DfA courses and curricula.

Recommendations for the 2nd IDCnet workshop

- Selection of experts: an improved representation of diversity, now that some insight is already available. Inclusive design refers to Design for All concept rather than disability concept.

- This should show in the understanding of diversity brief of participants and facilitators: it is a WORK-shop, Everything should be well prepared, relevant work package leaders should take time to do this well before the workshop and communicate with presenters and facilitators in order to build the program.

8.5   Annex: results brainstorming

1 awareness raising

- (recent) demographics etc.
- emphasise the diversity of users, no 'typical' user
- emphasise heterogeneous user groups
- usability is a subset of accessibility
- provide intellectual challenge to designers
- inaccessible web => invisible web
- www.nidi.nl
- method should be tailored
- provide opportunities for knowledge & attitudes to be tested by users/user groups in the broadest manner
- context of definition of user 'model' must be carefully explored
- own experiences
- identify national networks
- W3C/WAI outreach & training efforts
- collaboration with user groups
- having people with disabilities as presenters not only as a reference group
- demonstrating disabilities in practice
- accessibility an important aspect in competitions (e.g. selecting website of year etc.)
- turning problems to games/plays (experiencing, also for kids; not only students)
- examples of good practice: Moulton et al, Accessible Technology in Today's Business
- cultural and legislative differences should be considered in DfA products
- single source of information
- examples should relate to the non-expert
- examples should be contextual
- use videos
- focus on key actors
- multi-media presentations

2 why design for all

- ethical, legal, business considerations

- it is a human right / civic rights

- equal opportunities

- it ensures quality of education

- better to prepare rather than repair designs

- can help solve usability problems, designing for users different form oneself/users at end of bell curve ensures good design

- websites; if Google cannot 'see' your site, it's not on the web; how to make it visible to Google = make it accessible

- stimulate to include a paragraph in annual reports of companies to describe which group the exclude

- should be in the context that disability is a 'potential' for all of us

- better products, better services, better quality of environments

- sustainability of products and environments

- equal participation, more employment with income form work

- enlargement of market sectors and range of users

- part of community

- value capital of companies increases

- needs of users/customers are met

- awareness >> ethics >> brand/corporate image, philosophy >> commercialisation >> €€€

- own experiences

- way to manage all technology, info & devices around us

- avoidable premature medical retirement = €€€€

- quality of life

- citizenship

- integration

- expression of the designers professionalism

- good business case

- marketing instrument

- Each of us may have some impairment at some point in life

- Avoidable premature medical retirement = savings in not paying out retirement, and more productivity - keeping workforce

3 recommendations (legislation, guidelines)

- technologies are changing all the time, guidelines can't be too specific (or maybe should be considered dynamic/evolving)
- WAI guidelines (WCAG, ATAG, UUAG, XAG) easier to change than standards, become confusing when national organisations change them in adopting
- ISO 14915 multimedia
- ETSI HF WG reports on DfA, accessibility, multi-modality
- legislation: need case studies of where/how it is effective
- should be appealing
- all learning should be placed in a multi-disciplinary collaborative model & be aimed at different levels of the sector form undergraduate to continuing professional development
- JUTHA, ADA JOB
- in Finnish universities all students are entitled to take general courses and exams
- in Belgium enterprises with > 50 people need to hire at last 1 person with disabilities
- awareness of guidelines' limitations
- not replacing real knowledge
- focus on methods rather than guidelines
- standards etc. with praxis
- teach in a DfA way
- statistics
- identify outdated standards
- verifying potential business cases
- country specific standards
- IBM guidelines for accessibility of: www, java, software, lotus notes, hardware, peripherals
- Upcoming EU legislation; where to find info ?
- common understanding
- more binding legislation
- use eEurope action plan
- harmonised legislation and guidelines
- holistic curriculum / guidelines
- authoritative guideline

- World Wide Web Consortium (W3C): these have emerged as de facto standards:
    - o Web Content Accessibility Guidelines (WCAG): http://www.w3.org/TR/WCAG10/.
    - o User Agent Accessibility Guidelines (UAG): http://www.w3.org/TR/UAAG10/.
    - o Authoring Tool Accessibility Guidelines (ATAG): http://www.w3.org/TR/ATAG10/.
- Section 508 of the Rehabilitation Act (US Congress, 1998):
    - o http://www.section508.gov/final_summary.html.
    - o Additional information: http://www.section508.gov/About508.htm.
- Microsoft:
    - o The Microsoft Windows Guidelines for Accessible Software Design
- IBM:
    - o Web Accessibility Guidelines: http://www-3.ibm.com/able/accessweb.html.
    - o Software Accessibility Guidelines: http://www-3.ibm.com/able/accesssoftware.html.
    - o IBM Guidelines for Writing Accessible Applications Using 100% Pure Java: http://www-3.ibm.com/able/snsjavag.html.
    - o Lotus Notes Application Accessibility Guidelines: http://www-3.ibm.com/able/accessr5.html.
    - o Hardware Accessibility Guidelines: http://www-3.ibm.com/able/accesshardware.html.
    - o Hardware Peripherals Accessibility Guidelines: http://www-3.ibm.com/able/accessperipherals.html.
- Sun: Java Look and Feel Design Guidelines: http://java.sun.com/products/jlf/ed2/book/index.html (contain only a few notes on accessibility).
- ISO 13407:1999 - Human-centred design processes for interactive systems. (Focuses on design *processes*, not design as such. See http://www.usabilitynet.org/tools/13407stds.htm.)
- Existing legislation (cf. Policies Relating to Web Accessibility: http://www.w3.org/WAI/Policy/):
    - o Australia: Disability Discrimination Act;

- o Portugal: [Report and Resolution by the Parliament of Portugal regarding Web Accessibility](#);
- o UK: [Disability Discrimination Act](#);
- o USA: [Rehabilitation Act Amendments of 1998, Section 508](#), [Americans with Disabilities Act](#)]
- o Canada: "Common Look and Feel for the Internet" (May 2000; policy, not legislation): all federal government organizations are required to conform to W3C WCAG Priority 1 and 2 Checkpoints by 31 December 2002: http://www.cio-dpi.gc.ca/clf-upe/.

4 knowledge on accessible contents:

- MathML, SMIL, SVG, XHTML, XML: validated for accessibility out of how many thousands
- maybe having a framework of critically evaluating existing content & media for accessibility
- 2 channel principle
- knowledge of diversity of user groups
- typology of the different types of devices
- adaptable graphics
- Focus on structured documents (structure perquisite for accessibility)
- Techniques to make documents accessible (including conversion techniques)

5 knowledge on accessible interfaces

- audio touch, force feedback, speaking, gesturing, pointing, scanning, word prediction, voice input
- 2 channel principle
- guidelines text-to-?? Transforms
- knowledge of different types of content (xml, html, smil)
- assistive technologies (screen readers, on-screen keyboards, speech IO)

6 new paradigms of interaction (related to ICT)

- wearable computing, human body movement, emotion detection, brain-computer interface
- smart products
- voice, image recognition, pervasive/mobile/(context), location-aware-computing, 118N interactions (culture, language, metric, …)
- means to make the dreams/visions/scenarios come true

- wireless interactions

- haptic devices

- ambient intelligence

7 usability studies, HCI, user-centred design, evaluation methods

- Nielsen, Preece, Rubin, Scheiderman, evaluators, validators, regression tools (GUI)

- probes-method (UIAH Helsinki/smart design group))

- do not re-invent the wheel, use existing knowledge

- integrate users

- review

- think before implementation

- user-centred design

- evaluation methods: Userfit, Bobby, Valet, modelling, questionnaires, survey, emotional responses, user profiling, simulation studies

8 ICT application areas

- Important not to forget application of DfA in Arts and how ICT engineers with the arts.

- Employment

- Free-time applications

- Public transport

- User interfaces, documentation, online help, minimalistic design, intelligent devices, detecting which assistive technologies to use (device independence) user control

- eLearning

- eAdministration

- eMonitoring

- management systems

9 useful sources

- www.dined.nl,   www.nidi.nl,   www.scirus.com, www.io.tudelft.nl/research/ergonomics

- Danish Standard 3028 accessibility for all

- www.w3.org/wai/ed, www.agetree.com, www.baddesigns.com,

- user/user-group includes all the info & guidelines required

- DIN TR 124 products

- Danish Centre for Accessibility

- www.cft.dk (form&funtion-design dfa magazin)

- www.design-for-all.org (crisp&clear)

- IRIS

- Usable Net

- Trace Centre

- IBM Accessibility

- Microsoft Accessibility

- Abledata

- Gallaudet University

- Universal Design Handbook

- IT ways of learning and Teaching Universal Design

- Useit.com

? not identified yet

- user ≠ designer; users don't create a product, they contribute to it; users - sometimes contradictory comments; design is a profession. Users can't explain well what they do or want (eg getting into a car), so you have to observe them. The design methods through which you involve users relate to u... (Johan M.)

- after being involved in a test user might not be as useful for other parts of the design process

- to conclude from several user comments = a profession

- to observe user interaction might be more informative than to discuss with users

- translation: you have to present (Computer Science?) in different contexts (to engineers, aeronautics), so domain adapting is necessary (find appropriate motivation that fits the domain) (~Gerhard); cf. taking cultural and linguistic differences into consideration (Jim S)

- methods of how curricula are evaluated/validated/accreditation (Jim S)

- methods for promoting DfA; under 'Why DfA', add ...(?) (Ossi)

- understanding of DfA changes because framework changes, ICT changes fast (Ossi)

- DfA as a concept is not in a vacuum