The Challenge of Mainstreaming ICT Design for All

Gill Whitney[1], Suzette Keith[1], Barbara Schmidt-Belz[2]

[1]The Design for All Research Group, School of Engineering and Information Sciences, Middlesex University, London, UK
[2]Fraunhofer Institute for Applied Information Technology FIT, Web Compliance Center, Schloss Birlinghoven, D-53754 Sankt Augustin, Germany
g.whitney@mdx.ac.uk, s.keith@mdx.ac.uk, Barbara.Schmidt-Belz@fit.fraunhofer.de

Abstract. The education and training of ICT students and professionals with respect to Design for All is a vital part in the process of achieving eInclusion throughout Europe. This paper outlines the latest activity on the development of a curriculum in Design for All in ICT in higher education and professional development, and discusses some of the challenges of mainstreaming ICT Design for All. Concepts have been devised to introduce Design for All at bachelor-level of mainstream ICT education, to implement a masters degree in Design for All, and to provide training for professionals in ICT industry.

Keywords: Design for All, eAccessibility, eInclusion, Digital Inclusion, ICT (Information and Communication Technology),

1 Introduction

European society is changing; the population is ageing and the everyday tasks that people need to do require increasingly sophisticated e-skills. The future design of ICT products and systems will need to take into account the needs of all European citizens. Education and training of students and professionals working in Information and Communications Technologies (ICT) including computer sciences, information systems and web development is a vital part in the process of achieving eInclusion throughout Europe. Current and future researchers, developers, implementers of digital technologies and services as well as policy makers need a solid foundation from which to understand the wider needs of all technology users, creating opportunities for innovation and greater participation by all citizens.

The development of more accessible digital solutions have important economic and social benefits within Europe:

> "…bridging broadband and accessibility gaps, or improving digital competences, translates into new jobs and services. Initial estimates indicate that benefits from e-Inclusion in the EU could be in the order of €35 to €85 billion over five years."[1]

[1] COM(2007) 694Communication on e-Inclusion. Published by the Commission of the European Communities, Brussels

The European eInclusion policies set out for 2010 identified six key themes, including eAccessibility, ageing, socio-cultural inclusion and geographic eInclusion. The policies set out where action was needed to avoid the risks of digital exclusion to those already at risk of social exclusion and isolation, for example as a result of disability, age related changes, social disadvantage and remote rural communities. Future policies for 2020 include a focus on social empowerment:

> "Empowering people in inclusive societies. The acquisition of new skills, fostering creativity and innovation, the development of entrepreneurship and a smooth transition between jobs will be crucial in a world which will offer more jobs in exchange for greater adaptability"[2]

As digital technologies and services continue to evolve rapidly it is economically and practically vital to adopt a pro-active strategy whereby the designers and developers of mainstream systems have the awareness, skills and competencies to adopt best Design for All practices. This paper outlines the latest activity on the development of a curriculum in Design for All (DfA) and considers some of the challenges of mainstreaming this within ICT programmes.

1.1 The Requirement for Design for All in ICT Courses

The IST Coordination Action "Design for All for eInclusion – DfA@eInclusion" contributed towards the advancement of eInclusion in Europe, building on its networks of excellence throughout Europe to raise awareness, and developing resources. Towards this end, DfA@eInclusion continued, extended and enhanced previous efforts targeted to the creation of a sound, interdisciplinary theoretical framework of reference and a set of proven engineering practices, by addressing the following strategic objectives:

- Support to existing European initiatives to promote Design for All and in particular the European Design for All eAccessibility Network (EDeAN);
- Enhancement of existing partnerships between academic, research, user, and industrial communities to promote eInclusion through adopting and promoting effective DfA practices;
- Facilitation of DfA knowledge spillovers across industry sectors and communities through appropriate mechanisms for knowledge transfer;
- Support the mainstreaming of accessibility in ICT products and services through a series of dissemination activities.

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http://ec.europa.eu/information_society/activities/einclusion/docs/i2010_initiative/comm_native_com_2007_0694_f_en_acte.pdf

2 COM(2009)647 Commission Working Document, Consultation On The Future "EU 2020" Strategy. Published by the Commission of the European Communities, Brussels, 24.11.2009. Available from http://ec.europa.eu/dgs/secretariat_general/eu2020/docs/com_2009_647_en.pdf

The DfA@eInclusion project partnership represented 23 European countries. These partners helped to identify courses and programmes in ICT offering Design for All content. This review identified 50 courses offered by 35 course providers in 18 European countries. There were few specialised courses offering Design for All content, however it was possible to identify examples of hidden elements which were embedded in mainstream computing and technology programmes [1].

2 Why Europe Requires the Mainstreaming of Design for All Training

Within Europe there have been a number of initiatives and campaigns that serve to emphasis the need for training – improving the skills of users, addressing the needs of an ageing population and improving the understanding of the needs of these users by industry.

Most recently, the requirement for Europeans to acquire e-skills was reiterated in e-skills Week 2010, when Vice-President Antonio Tajani - Commissioner for Industry and Entrepreneurship, Neelie Kroes - Commissioner for the Digital Agenda and Androulla Vassiliou - Commissioner for Education, Culture, Multilingualism and Youth, issued a joint statement, stating that:

> "Improving digital literacy is crucial to Europe's future. We must invest in the e-skills of all EU citizens to make sure that no one is left behind as the economy goes digital. Digital literacy and media literacy are crucial components of digital inclusion: people should be able to use computers and the internet, while understanding how the web actually works and how to assess the online information." [3]

Europe is also facing the social and economic effects of an ageing population. Viviane Reding, EU Commissioner for the Information Society and Media drew attention to the need for more accessible products and services:

> "Europe's ageing population is a challenge for our job market, and its social and health systems. But it is also an economic and social opportunity. ICT will provide new and more accessible products and services that meet the needs of older people."[4]

[3] e-skills: European Week 2010 underlines e-skills' potential to help Europe's economic recovery available from http://europa.eu/rapid/pressReleasesAction.do?reference=IP/10/220&format=HTML&aged=0&language=EN&guiLanguage=en

[4] IP/07/831 (2007) €1bn in digital technologies for Europeans to age well available from http://europa.eu/rapid/pressReleasesAction.do?reference=IP/07/831&format=HTML&aged=1&language=EN&guiLanguage=en

In response to a report on "Ageing Well" it was announced that €1 billion would be spent between 2007 and 2013 in research and innovation for ageing well. The Ageing Well report noted that:

> "Industry still has limited understanding of comparative user requirements, such as socioeconomic factors, gender needs and income levels that may impede access to ICT, personal attitudes and sensitivities to ICT, and even of lifestyles"[5]

The changes brought about by the rapid introduction of digital technologies and services and the ageing of the population affect both what skills are required by the population of Europe and the attributes of the population who need to be digital skilled. In the longer term, it requires that the technology developed by industry is designed in a way that enables the end user to understand and make use of the full functionality of the device and the services provided. The aim of this paper is to examine how designers and creators of future ICT systems can, as the results of better education and training in Design for All practices, contribute to the development of systems that are fully accessible and usable.

3 The Current Situation

The DfA@eInclusion project identified many pockets of excellence where committed academics and professionals passed on their skills and knowledge. But the situation is not uniform and small pockets of best practice knowledge will not be sufficient to ensure that the technology of tomorrow is accessible by the European citizen of tomorrow.

3.1 The academic approach

Over the life of the DfA@eInclusion project, the project partners reported concerns over the implications for mainstreaming versus specialist training. The argument for mainstreaming of DfA principles and practices is one of greatly increasing awareness to all ICT and design students and in parallel engaging multidisciplinary awareness in social sciences and humanities of the social issues.

The counter-argument for specialist programmes is increased professional recognition of the skills and knowledge needed to identify and solve complex problems. However, the argument against specialisation raised by the partners includes the risk factors for student and institution of becoming too specialised, diluting core technical skills and therefore limiting opportunities for employment – in effect the 'return on investment' for the student.

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[5] COM(2007) 332 final Ageing well in the Information Society. Action Plan on Information and Communication Technologies and Ageing from http://ec.europa.eu/information_society/activities/einclusion/policy/ageing/launch/index_en.htm

Progress in extending or developing bachelor and masters level modules with greater DfA content taking account of both specialisation and mainstream integration has been made. A recent survey of the DfA@eInclusion European project partners revealed new and extended courses:

- MSc Digital Inclusion validated to run at Middlesex University UK.
- Creation of a new module on accessibility to be introduced to new MSc Human Computer Interactions University of Siegen Germany (2010)
- New course on Assistive technologies introduced in Czech Republic
- Planned introduction of new Masters in Web design at Linz, Austria
- Planned course opportunity within new MSc Health Informatics Engineering in Hungary.
- Planned expansion of MSc across Europe: interest has been expressed by partners in Greece, Austria, Malta and Finland

While progress is somewhat slow, these results are encouraging in gaining recognition of the many stakeholders: educational institutions, the academics responsible for course delivery, the student population, future employers in major industries and user representative organisations.

Curriculum guidelines have been prepared to support the development of new programmes and modules at bachelor and masters level (for more details of the curriculum guidelines see: www.dfaei.org). Particularly relevant to the argument for mainstreaming is the proposal for a short introductory module, equivalent to 2 ECTS, given to bachelor level students in their first or second year. This has the potential for reaching the greatest number of students, who may return to the subject at a later stage of their learning. The key objectives for this module are:

- To become aware of the rights and needs of all citizens to have equal access to the information society.
- To become aware of the opportunities and challenges in creating, developing and providing information technologies and services that are socially inclusive

This could be delivered as a named module, so that it subsequently appears on the transcript of modules taken, integrated into a wider module on ethical and social issues of technology or even, as found in one example of best practice, fully integrated throughout the bachelor programme.

3.2 The Industry Approach

ICT industry needs short-term solutions when taking up new methods. Professionals who currently work in ICT industry need to acquire the necessary knowledge when taking up the challenge to implement Design for All principles in their development processes.

A survey among companies in the UK in 2006 revealed "lack of knowledge" as one of the top obstacles against implementing Design for All in commercial projects, next to lack of time and money [2].

We did a similar survey among those 27 professionals who had attended a training course "Introduction to eAccessibility" in Germany and Ireland, 2009. The top obstacle was lack of knowledge, followed by lack of time. This sample is too small to generalize the results, but it suggests that we still have not overcome "lack of knowledge" as an obstacle against Design for All. We also believe that lack of knowledge, from a company's economic point of view, is an equivalent to lack of time and/or lack of money.

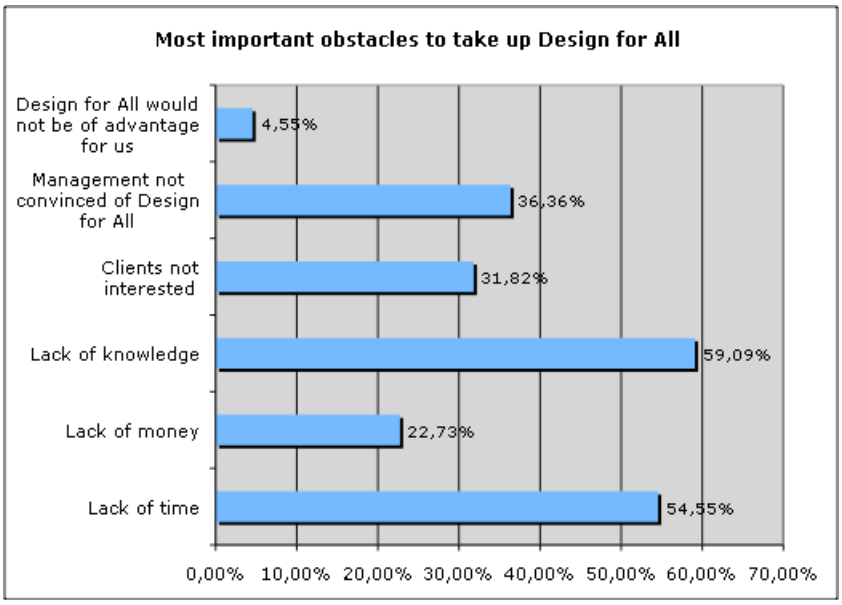

Fig. 1 Our survey confirms "Lack of knowledge" as a top issue when considering Design for All principles for ICT projects.

The training of professionals has some specific requirements compared to training provided for university students. Typical training arrangements for professionals will allow them to stay in their full-time job, and indulge in a (short) period of non-formal learning, such as taking a tutorial, later continue to learn on the job in an informal way.

For the non-formal training of professionals, the DfA@eInclusion project has specified a comprehensive curriculum. It consists of 10 topics to be covered, each topic offered at three levels of granularity, and a recommendation for which professionals in ICT industry which levels would be appropriate. The specification of the curriculum is accompanied by references to available training material that matches each unit, and a list of recommended reading [3]. The curriculum and guidelines are the result of discussions among experts from research, industry and other stakeholders, e.g. during a 2-days workshop in Sankt Augustin near Bonn, in September 2007, and since May 2009 in a CEN workshop.

We investigated the current availability of teaching materials for these topics by asking our contacts in industry and other stakeholders for existing training material. Additionally, an extensive web search was undertaken. This search showed that there is training material available in the area of Web Accessibility, but not in all of the other topics. Thanks to the activities of the W3C group, and in particular the Web Accessibility Initiative (WAI), there exist very concrete, comprehensive guidelines on how to create accessible web sites. Based on this, several initiatives and companies have provided training material, such as online tutorials about web accessibility [4-6]. For other technologies, such detailed and concrete accessibility guidelines are often missing, and in consequence, there is a lack of training material addressing professionals in industry.

Table 1. These 10 topics should be covered by a Design for All training for professionals in ICT industry.

Topic	Description
Design for All and Target User Groups	Awareness of users with impairments; principles and motivation for Design for All
User Interfaces	Accessible user interfaces; new paradigms
Back-end Technologies	Impact of back-end technologies on accessibility and adaptability
Web Applications	Accessibility of Web content, authoring tools, user agents and services
Consumer Electronics, Games	Accessibility of devices for entertainment and communication
User-Centred Design	Principles of human-centred design process as a frame for Design for All
Evaluation	Evaluation of qualities of use, in particular of accessibility
Assistive Technology (AT)	Assistive technology; the role of AT in a Design for All approach
Business Cases	Business cases of implementing Design for All in a company
Ethics, Legislation, Privacy	Legal and ethical basis of Design for All; legal aspects of user involvement in development and personalization of services

In order to provide more widespread support for the development of training materials for industry, the CEN workshop "Curriculum for training professionals in Universal Design" (CEN WS/UD-Prof-Curriculum)" was started in May 2009. A CEN workshop allows experts and stakeholders in an area to work towards a CEN workshop agreement, stating their common understanding and recommendations. A CEN workshop agreement on curricula for training ICT professionals in Universal Design shall ensure that training will be adequate, comprehensive and meets Industry needs. More information, including options to participate, can be found at:

http://www.cen.eu/cenorm/sectors/sectors/isss/workshops/ws-ud-prof-curriculum.asp. The final CEN workshop agreement is expected in Autumn 2010.

4 Conclusion

In the future, Design for All training within European ICT academic and industrial courses needs to transform from a specialist element taught by committed experts for a limited number of highly motivated students, to become an essential part of all ICT courses. ICT, used within the mainstream, will increasingly allow older people to stay active and productive for longer; to continue to engage in society with more accessible online services; and to enjoy a healthier and higher quality of life for longer.

Technology education will need address the challenges of the social, economic and political contexts in which technology is used and the diversity of user requirements. The curricula produced by the DfA@eInclusion project can be used to facilitate this change. Many researchers in this area are becoming increasingly aware of the need to pass on their knowledge and need to be given the opportunity to deliver new and modified courses. Academics and trainers within ICT mainstream teaching will need to be encouraged and supported to integrate elements of DfA and eInclusion issues, highlighting the latest achievements and opening up opportunities for original research.

The curriculum guidelines provide the essential objectives and learning outcomes to be achieved. The DfA@eInclusion project and the EDeAN network calls on all experts within the ICT field to rise to the challenge of creating innovative programmes that will attract mainstream students in ICT, technology and design.

Further information about the training activities of the DFA@eInclusion project can be obtained at: http://www.dfaei.org.

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