Towards an Environment that Supports Internet Design for All

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SUMMARY

Over the last few years, work on recommendations, methods, and tools for 'Design for All' (DfA) has increased awareness regarding the incorporation of requirements of people with special needs into systems designs. However the extent and impact of this work in Internet-based services has not yet been widely seen. A large part of recommendations for Internet-based services has been developed quite recently and thus has not been widely taken up in design and development. Furthermore, most of this work has not been provided to designers and IT industry in forms that can enable them to easily include it within the design process. IST project IRIS is a recently started project, which aims to design an architecture and develop an environment, which will aid designers to design for all. IRIS argues that breadth of design-for-all recommendations, tools and methods needs to be presented to designers in a manner that can easily be integrated with the design process.

KEYWORDS: Design for all, universal design, design support, accessibility, recommendations, architecture.

INTRODUCTION

The wide scale participation of all citizens, including those with special needs or impairments, in information society systems and services depends heavily on the provision of generic, multi-modal, highly adaptive and personalised means of access. This is especially true for Internet-based systems and services, which have gained much prominence in the last few years in various human activities such as work, education, leisure and commerce.

From the perspective of the Information Technology (IT) professional, the process of designing and developing for an inclusive information society requires awareness and to-the-point guidance with respect to these design-for-all tools. Unfortunately designers are not usually well guided with regard to the deployment of such tools and fail to identify their suitability [5][14]. As a result, most of service designs address average persons' needs. However, as identified at the recent GEN/ISSS Open Meeting on Design for All

and Assistive Technology, 'few people represent the average person, with the consequence that if a product is designed for the average person, it might be uncomfortable or impossible for most people to use it' [4].

In order to provide to the point guidance to designers of Internet services regarding 'Design for All' (DfA) recommendations, methods and tools, there is a need for a purposeful synthesis and elaboration of various strands of related work into a format that can be easily applied into the Internet service design process. This paper briefly illustrates the breadth of DfA recommendations, methods and tools and discusses issues related to their direct applicability by designers of Internet-based services. It proposes an approach for the elaboration of this work into a DfA support environment that can be used by designers of Internet-based services and presents the basic functions of this environment.

THE BREADTH OF DFA RECOMENDATIONS

The term 'Design for All' has been widely used in a number of contexts. As summarised in [10], the terms 'Universal Design' and 'Design for All' have been used interchangeably and 'for some individuals, they are considered as new politically correct terms, referring to efforts intended to introduce "special features" for "special users" during the design of a product. To others, they are deeply meaningful and rich topics that elevate what designers like to call "good user-based design" to a more encompassing concept of addressing the needs of all potential users'.

Despite the fact that there might be dangers lurking when examining concepts, methods, tools, techniques etc. under such a generic spectrum, the latter consideration entails an inclusive approach towards product and systems design and is especially appropriate for the work described in this paper. This general perspective requires that a wide range of methodologies, methods, recommendations, techniques and tools that can provide aid to various phases of the design process should be taken into account in an approach towards aiding designers to design for all.

An empirical enumeration that represents the broad and disparate nature, of work in the area of Internet-based services, that is relevant to 'DfA' concepts, includes work and tools relevant to: accessibility, usability, user profiling, semantics/ metadata/ description of content and media, cognitive/ reactive models of perception and action, and models of interaction. These strands of work, although not constrained only to Internet-based systems and services, they can provide useful references to Internet designers at various phases of the design process, such as requirements, design, development, valuation − not necessarily in this order, as shown in Figure 1.
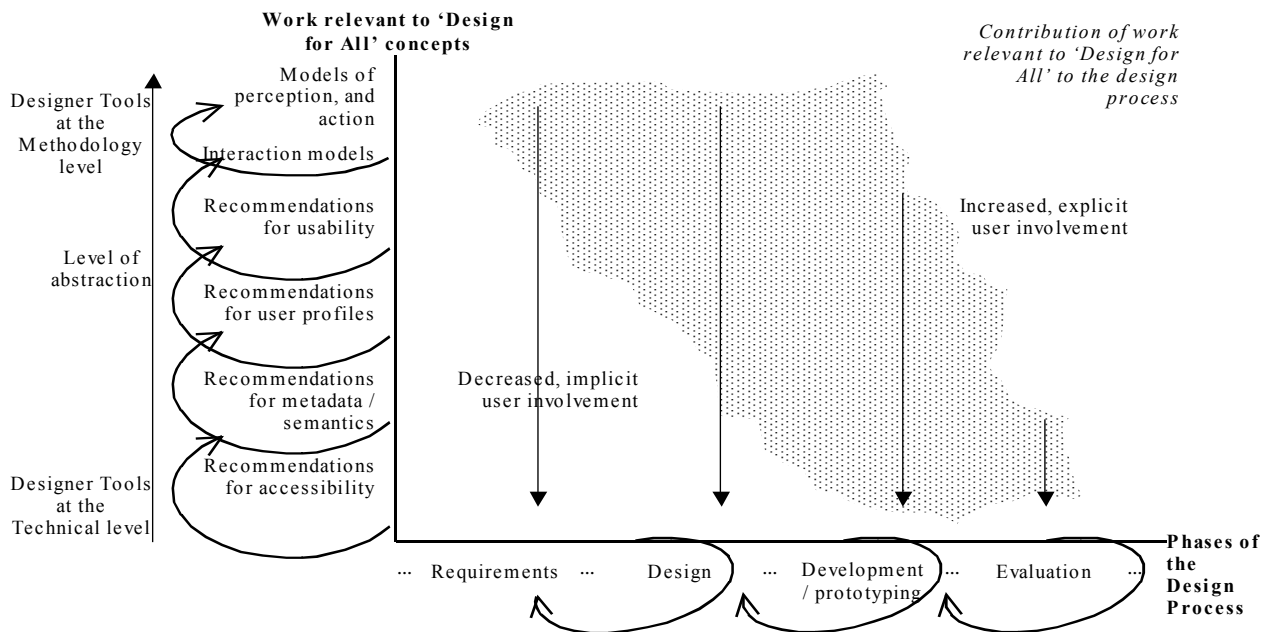
Figure 1: Contributions of work relevant to 'Design for All' to major phases of the design process.

The effect of this existing body of work, relevant to 'DfA' concepts, cannot be strictly bound to specific phases of a particular methodology or design process (thus, in Figure 1 we use small dots to reflect this vagueness). Generally, whenever these tools cannot provide formal solutions, which can assist designer in an automatic manner, user involvement is usually more explicit and increased.

The elaboration of work relevant to the 'DfA' concepts, methodologies, methods, recommendations, techniques and tools is a major objective of the IRIS project. This task is the starting point for the development of a framework for aiding designers to incorporate this work into their methodologies and design processes.

Unfortunately designers rarely take into account the breadth of issues regarding the incorporation of work related to 'DfA' concepts. Most often, designers focus on work that contributes directly to the development and prototyping phases of the design process [14][13].

UPTAKE OF CURRENT DESIGN FOR ALL RECOMMENDATIONS AND RELATED TOOLS

The uptake of some of the aforementioned recommendations and tools has been impressive. For example, when the W3C.WAI (World Wide Web Consortium – Web Accessibility Initiative) was formed in March 1997, there were over 40 documents that had been written to address web accessibility ; since then WAI recommendations and guidelines (especially those related to Web Content Accessibility Guidelines (WCAG) [2], Authoring Tool Accessibility Guidelines (ATAG) [12] and XML Accessibility Guidelines (XMLGL) [3]) have gained wide acceptance worldwide. Especially in terms of WCAG, various fora, which had published Web accessibility guidelines in the past, have now adopted WCAG and propose their implementation, including the Swedish Handicap Institute (SHI), the UK E-Envoy's Office; the US, NCAM (National Centre for Accessible Media), and others.

In terms of Web development tools, there is a minimum level of awareness on accessibility issues. The most widely used tools already support a few technical fea-

tures that promote accessibility [7], however, more work needs to be made towards this direction.

The issue of take up of design for all recommendations and tools is also related to legal frameworks that may force IT industries to design for accessibility. A number of countries have already developed such frameworks (such as US, Canada and Australia), while other countries (like those in European Union and Japan) are active in the effort for establishing legal frameworks for an inclusive information society.

The degree of uptake of some of the above recommendations and tools reveals that there is a good level of awareness regarding accessibility and usability of Internet-based services. However, from the breadth of usability and accessibility issues to be dealt, only those that ensure technological interoperability seem to be addressed in the above contexts. For example, at the level of legislation, the UK E-Envoy's Office will shortly publish version 2.0 of the Guidelines for UK Government Websites that recommends 'as policy' that all Government sites comply to W3C.WAI WCAG level-A, which is the lowest priority level that W3C.WAI has introduced. Despite the major US IT industries being aware of accessibility issues (many of them being WAI members), it is still uncertain whether the recommendations and tools described above are actually used into the actual design processes of large IT industries, and moreover of IT SMEs, especially in Europe.

APPLICABILITY OF CURRENT DESIGN FOR ALL RECOMMENDATIONS AND RELATED TOOLS

In order for the aforementioned strands of work, to be applied by designers in Internet service designs, this work needs to be provided in a manner by which designers can easily be guided regarding the context of application and type of assistance they offer.

Besides tools that can aid designers at the technical level, to which detailed guidance can be given quite easily, there seems to be a lack of tools that can aid designers at the methodology level. The format and language of writing a recommendation is helpful but is certainly not enough for understanding and interpreting to particular contexts. For example standards normally contain statements that are requirements (these must be complied with to have conformance and contain in English the word 'shall') or recommendations (these are weaker, English 'should') [11]. In nearly all of the standards, as well as the guidelines, the statements are recommendations, be-

cause the standard aims to be general enough to cover a wide variety of applications [1].

On the other hand, the task of placing guidelines that are general in scope into a particular context is not easy [5]. Such tasks, related to the interpretation of general in scope recommendations, may discourage designers to consider the use of such recommendations in their design processes. Therefore the existence of tools that can relieve designers from the task of interpreting large sets of guidelines and standards is very important for designers and can aid them in many ways and tasks. WAI guidelines and recommendations try to minimize the effort of the designer to include them by the publication of techniques that facilitate its implementation.

In the case of the Internet, it can be said, that it is possible to make some requirements statements, especially in the case of accessibility issues. However, as long as these remain on issues related to compliance with formats and conversions, these may fall far short of the actual needs of the users, as can be seen in for the grading between different types of WAI guideline compliance, from level-A to triple-A.

Furthermore, work on HCI and usability is very important for promoting accessibility. This work seems not to have been taken into account carefully in some cases of recommendations and tools. For example, there are quite a few tools that address a set of usability issues [7]. Furthermore, as recognised by W3C.WAI ATAG [2] the issue of '*user prompting*' is an important notion in authoring tool guidelines and there is quite substantial work from HCI that could be taken into account and enhance this part of the guidelines. For example, according to (Mc Farlane, 1999) four well-known methods for coordinating user-interruption exist: (a) immediate; (b) negotiated; (c) mediated; and (d) scheduled. These methods can be further studied in the context of authoring tool accessibility and provide a richer perspective on this issue.

Tools are very often only a starting point, helping to pinpoint problems. A good analogy may be to say that using them is like using Microsoft Word to check grammar—it can highlight potential problems, but each identified issue for its appropriateness needs to be evaluated. The tools can check routine site-design elements for consistency, and thereby encourage good design practices. As well as complementary aids to, for instance, directly observed usability tests. Even then, the need for evident reasoning regarding the context of use of a tool is very important.

AIDING DESIGNERS TO DESIGN FOR ALL: THE IRIS PROJECT OBJECTIVES AND GOALS

The objectives of the IRIS project are to:

- Encapsulate into a design aid environment, work on design-for-all tools and methods; user modelling theories and methods, including users with special needs; guidelines, recommendations and results from work about hypermedia, enrolment and accessibility; and
- Use this environment to redesign and enhance existing services in the areas of teleworking and electronic commerce, guided by rigorous user testing and evaluation.

The operational goals of the IRIS project are to:

- Identify the suitability of a range of tools and methods, including metadata, for delivering media and alternating content formats relevant to multimodality in the service of accessibility;
- Elaborate user requirements, involving large and international groups of users with special needs, relevant to media and translate these models into technical characteristics of communication channels so that services may be configured to these characteristics;
- Specify, design and develop the information infrastructure that is required to adapt delivering media and content to user preferences and characteristics, making use of relevant standards, based on state of the art directory services technologies, as part of the design aid environment;
- Specify, design and develop user centred techniques and mechanisms for adaptation of media and content to user preferences and characteristics, based on state of the art intelligent agent technologies, as part of the IRIS design support environment;
- Further develop existing Internet services, based on the above findings and tools, in the selected areas of electronic commerce and teleworking / online learning;
- Perform user evaluation and validation of the enhanced designs and services, involving large, international groups of users with special needs, which will enable IRIS to make the best use of their varying requirements and insight;
- Offer generic recommendations for enhancements of Internet-based services, addressing the IT professionals community, based on the above findings and experience;

THE CONTEXT OF THE IRIS DFA SUPPORT ENVIRONMENT

The IRIS design support environment aims at supporting all designers to design web applications / services for all users based on user modelling. A first abstract view of the IRIS design support environment situated within its environment is shown in Figure 2.
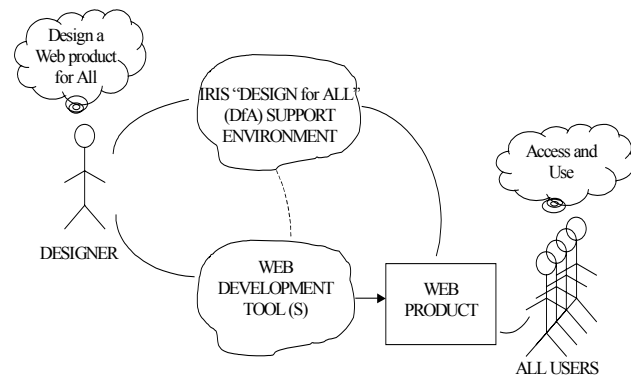
Figure 2: The context of the IRIS design support environment.

The IRIS design support environment is a new element in a typical design process, where a designer aims to produce a Web product with the use of a (set of) Web development tool(s). The need for the design support environment is created from the observation that the designer is engaged to solve a design problem that requires a 'DfA' approach, which is not readily offered by existing Web development tools. Work currently in progress has surveyed designer preferences regarding how they would like to receive design aid. The replies range from static references, e.g. good book, succinct presentations, video materials, via educational materials, such as courses and training materials; to interactive web based materials in form of public Q&A fora, or help desks [IST DASDA project]. The IRIS design support environment will attempt to provide some of the range of help including pointers to static materials; educational materials, to support for technical evaluation tools.

As can be seen from this conceptual level of analysis, the IRIS design support environment would be able to act synergistically with existing Web development tools with the purpose of supporting the designer in a generic manner and scope, covering the full lifecycle of the design process from problem understanding until development and testing, to apply 'DfA' concepts to the analysis, design and development of Internet services. Thus, the IRIS design aid environment is not just another Web development tool, but instead allows self-produced interfaces and/or elements relevant to 'DfA' to existing development tools.

From the perspective of the designer the IRIS design aid environment could be used either via their preferred Web development tool –by linking it to the provided API– or via its own interaction module in order to sup-

port the designer in phases of the design process. In the first case the link between the IRIS design support environment with Web development tool(s) can enable the IRIS design support environment to monitor the design process proactively and possibly act in this manner in order to provide assistance to the designer. In the second case the design problem may be communicated to the IRIS design support environment (via suitable mechanisms and rules) and/or the Web development tools according to the communication language(s) used.

The ultimate aim of the designer is to produce a Web product, e.g. an Internet service. For the purposes of the IRIS project there will be developments and demonstrators in Internet services in the selected areas of teleworking and electronic commerce. How-ever, the scope of the IRIS design support environment is to provide assistance to designers at a generic level and support the design process beyond these domains of application.

THE FUNCTIONAL ARCHITECTURE OF THE IRIS DFA SUPPORT ENVIRONMENT

The IRIS DfA support environment will support Internet designers / developers (including people with disabilities) to implement Internet applications for all. They could use their own favourite Web development software but at the same time they will be provided with supporting modules that will assist online and offline the designer to accommodate accessibility issues on his web design. The basic functional modules of the IRIS DfA support environment are:
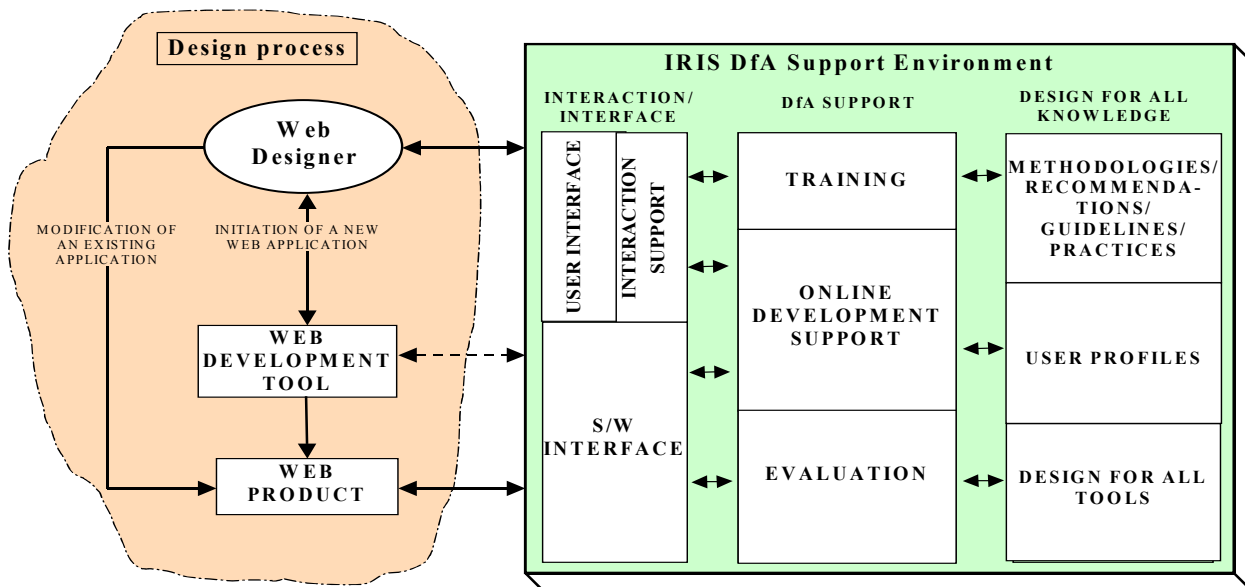
Figure 3: A first view of the IRIS design support environment functional architecture.

Interaction: This module consists of the IRIS DfA support environment user interface, the interface to other software, which will be mainly designed in the form of APIs (Application Program Interfaces) and interaction support, which will employ mechanisms for interactive dialogue with the designer (user) based on user modelling approaches.

DfA support: This module consists of components that can aid the designer (user) both online and offline: Online aids include the online development support, validation / check and component (i.e. software components and objects) delivery, while instruction, evaluation and decision support can be either online or offline aids.

DfA Knowledge: The IRIS DfA support environment will require a large amount of DfA knowledge, which can be either encoded inside the environment or externally available. This knowledge includes existing methodologies, user requirements and modelling, and their translation to technical characteristics, recommendations guidelines, standards, case studies and possibly other types of knowledge.

This multifarious work will also enable IRIS to provide generic recommendations for enhancements of Internet-based services, addressing the IT community, based on the above findings and experience. It has to be noted that the functional components identified in **Figure 3** will be revisited during project developments and external to the project evaluations according to the project workplan.

CONCLUSIONS AND FUTURE WORK

The paper argued in favour of the need for an environment that can support designers to design for all. It illustrated aspects of 'DfA' work that need to be elaborated into this environment and outlines its form at a conceptual and functional level.

As project progress continues, IRIS will elaborate its functional architecture to technical specifications. In this directions some initial technical decisions have been made to ensure accessibility, usability and systems adaptivity (relatively to user profiling and content metadata). With regard to accessibility, IRIS will apply the W3C WAI guidelines for accessibility of Web Content [2] and Authoring Tools [12]. Furthermore, IRIS has started work that applies methods for evaluating user interfaces of existing Internet services, which have been also used for the usability evaluation of GMD's BSCW teleworking platform (http://bscw.gmd.de). With regard user profiles, IRIS will implement specifications for personal information profiles that stem out of the LDAP Person specification (such as [7]) and will also consider the implementation of CC/PP (Composite Capabilities / Preference Profiles) ([6]) to ensure cross-device access to IRIS services. Finally with regard to content metadata IRIS will base its work on XML-related specifications such as XSLT (eXtensible Stylesheet Language Transformation)

The work described in the paper is work in progress. The IRIS consortium actively seeks collaborators in the area of design for all in order to achieve better developments in the area and ensure that IRIS results are validated by experts external to the project.

ACKNOWLEDGEMENTS

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