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## **Online Communities for All: The Role of Design for All in the Formation and Support of Inclusive Online Communities**

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### **ABSTRACT**

An online community is a virtual community composed of individuals who form and maintain online communication, share common goals, interests and needs that provide the reason of community existence, and use common interactive tools that support their networking and communication activities. The term “networking” is traditionally used to describe the formation and maintenance of connections and relationships between individuals, organizations or other interested parties. Virtual or online networking is a form of interpersonal communication that is characterized by the use of electronic means of communication between the different parties and the exchange of messages and information in electronic forms [11]. Hence, virtual or online communities perform virtual networking.

This paper aims to examine how the principles of Design for All can support the formation and operation of online communities that are fully inclusive, multi-cultural and multiplatform, thus providing an infrastructure essentially accessible to all their members to carry out virtual networking activities. Following an introduction to online communities and community formation, the paper briefly builds the case for Design for All and the challenges for new information and communication technologies towards a fully inclusive Information Society. Then, based on practical experience and case studies, the paper examines the benefits and challenges of applying the principles of Design for All in the design, development and support of virtual interaction spaces, in order to cater for the diversity of users-community members, as well as of their environments of use. The paper concludes by proposing a set of design issues to be taken into account in the development of online communities for all.

### **1. INTRODUCTION**

Over the last years, important changes have been experienced in the ways people use and interact with the Internet and Information and Communication Technologies (ICT) in general, as well as in the ways people communicate and interact with each other through the use of such technologies. A very interesting issue in this respect is the emergence of online or virtual communities and the

social impact brought about from the novel channels of information exchange and knowledge sharing. The formation and operation of online communities is by definition directly linked to new Information and Communication Technologies. As a result, online communities can take advantage of the vast potential of these technologies to enable people to communicate and share information in many new forms. On the other hand, the increasing speed with which such technologies advance and become available in the market brings forward the question of widespread use and availability, and, most importantly, accessibility to all users. In other words, new ICTs on the one hand empower individuals, while on the other increase the risks of social exclusion. This paper briefly presents the notion of online communities and community formation, and brings forward a Design for All approach to the formation and development of online communities, as a systematic approach to address accessibility and facilitate the creation of “online communities for all”, i.e., communities that are formulated and operate virtually, able to accommodate all varieties of users, irrespective of their physical (dis)ability, socioeconomic or cultural background.

## **2. DESIGN FOR ALL IN INFORMATION SOCIETY TECHNOLOGIES**

The emergence of the Information Society and the Information Society Technologies (IST), i.e., the new technologies that constitute the driving force of the Information Society, signify the transition towards a new form of society based on the production and exchange of information and, in effect, of knowledge. The consequent changes affect not only the interaction in computer-mediated human activities, but also individual human behavior, collective consciousness, and the economic and social environment. As a result of IST developments (e.g., proliferation of diverse interaction platforms, such as wireless computing, wearable equipment, kiosks, etc.), the range of the population that may gradually be confronted with accessibility problems extends beyond the population of disabled and elderly users to include all people. Moreover, the social and cultural infrastructure which enables a positive social and economic environment and community-based activities may not support the new requirements of the emerging “knowledge society” [8]. Hence, instead of being empowered by IST, disadvantaged or excluded groups, including the unskilled, disabled, and the elderly, face the danger of further marginalisation.

Nevertheless, access to information is a basic right and the increasing amount of publicly available information is even more important for people with disabilities and other groups at risk of exclusion. Today, a socially inclusive and universally accessible Information Society is a critical quality target and a global requirement that entails coping with diversity in: (i) the characteristics of the target user population (including people with disabilities); (ii) the scope and nature of tasks; and (iii) the different contexts of use and the effects of their proliferation into business and social endeavours [1].

However, a number of obstacles are yet to overcome in order for disadvantaged groups to be able to fully benefit from it. Many may seem sceptical about new technology, as it could eventually lead to new forms of discrimination, if part of the population is not able to access it [7]. Traditionally, problems of accessibility to computer-based applications and services were addressed by adapting products designed for the ‘average’ user through Assistive Technology products. With the development of the Information Society, this approach has shown, in the context of more than a decade of research efforts, several limitations, due to a number of reasons:

- The technology under development is so complex and varied that it is not completely clear how the Information Society will actually develop in the future, what technology will be actually deployed and how users will have to interact with the emerging intelligent environment;

- The services and applications that will, in fact, constitute the part of the Information Society visible to the users, are not yet defined in detail (the meaning of services and applications in this context is broader than the present definition in information technology and telecommunications: for example, a smart house include interactive technologies that support various user tasks);
- Accessibility to the foreseen information environment will be so crucial for the population at large that it is imperative to preclude IST emergence in a form that is not accessible by design to large portions of the population;
- The changing nature of the information society means that the issue is not just of information provision to the user but of information utilisation by the user, enabling them to carry out tasks as varied as cooking a meal, booking a holiday or applying for a parking permit.
- Service providers are reluctant to introduce universal accessibility engineering into their development process.

Therefore, it is necessary to develop and adopt more generic, systematic and easy to follow approaches to the issue of accessibility, which are identified under the term “Design for All” (DfA). Conceptually, the DfA approach is a well-defined body of knowledge, which has brought about very important results in architecture, industrial design and new media design. In the Information Society, the adoption and practice of DfA, although advocated by many actors in the field, still presents significant challenges, due to the inherent characteristics of the sector, and in particular the established industry practice of designing mainstream products targeted to the so called ‘typical’ user. In the context of this paper, DfA has a broad and multidisciplinary connotation, abstracting over different perspectives [4], such as:

- Design of interactive products, services and applications, which are suitable for most of the potential users without any modifications.
- Design of products, which have standardized interfaces, capable of being accessed by specialised user interaction devices.
- Design of products which are easily adaptable to different users (e.g., by incorporating adaptable or customisable user interfaces).

From the above, it follows that DfA either subsumes, or is a synonym of, terms such as accessible design, inclusive design, barrier-free design, universal design, etc., each highlighting different aspects of the concept.

From a business point of view, the logic of DfA is the increase of market share and the fact that, if implemented from the starting point of a project, it has an affordable cost for the benefits it offers [1]. On the other hand, from the legislator’s point of view, there is also an increasing amount of pressure towards addressing DfA in policy and legislation. Access to data, information as well as IST and e-services for individuals with disabilities has to be, by definition, equally comparable to that offered to able-bodied individuals. This should be seen as a social prerequisite. Towards this concept, in a number of countries, accessibility is nowadays required by law<sup>1</sup> (e.g., Australia, Germany, Italy) and regulated by newly introduced policies (e.g., European Parliament, 2002 [9]). For example, in the USA, web sites are additionally required to comply with the provisions of "Section 508" of the US Rehabilitation Act [17], while on the other side of the Atlantic, the UK's Disability Discrimination Act [16] is an example of legislation that encourages a contextual

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<sup>1</sup> For more information see International Policies Relating to Web Accessibility at: <http://www.w3.org/WAI/Policy/>

approach to accessibility. However, results of recent surveys show a very low conformance to those accessibility guidelines [12].

### **3. DESIGN FOR ALL METHODOLOGIES IN USER INTERFACE DEVELOPMENT**

The driving force behind the concept of DfA has been the establishment of theoretical grounds and the provision of technological solutions facilitating the development of user interfaces of services and applications, which are inherently accessible and usable by all potential user categories. This was the focus and content of the ACCESS project<sup>2</sup>, which delivered a user interface development methodology, as well as several tools and prototypes, to substantiate the viability of the DfA perspective into Human Computer Interaction. The proposed approach was based on the intelligent self-adaptation of user interfaces for addressing the requirements for customisation, accessibility and usability. The methodology and tools developed by ACCESS were applied and extensively tested in the context of the AVANTI project, which developed a web browser capable of intelligent self-adaptation and inherently accessible by sighted, non-sighted, speech-motor and language-cognitive impaired users. More recently, the PALIO project<sup>3</sup> extended the proactive approach by considering various forms of user interface and content adaptation, including adaptation based on the geographical location of the user.

In recent years, there have been efforts toward the establishment of a multidisciplinary community of people combining expertise in accessibility and in telecommunication services and applications, and towards creating synergies between relevant expertise, such as the IS4ALL thematic network<sup>4</sup>, aimed at establishing a wide, interdisciplinary and closely collaborating "network of experts" (Working Group) to provide the European Health Telematics industry with a comprehensive information package detailing how to appropriate the benefits of DfA. These efforts need to be continued and further enhanced in order to consolidate knowledge and facilitate the wider adoption of DfA practices.

In addition to the above, other European initiatives have also contributed to raise awareness on accessibility issues and create an environment in favor of DfA. The COST actions 219<sup>5</sup>, 219bis and 219ter seek to promote research in the field of telecommunications and teleinformatics with the aim of proposing solutions to the problems related to the needs of disabled and elderly people in providing access to new telecommunication and teleinformatic services. The main objective is to increase the availability of telecommunication services and equipment so that they are also accessible to elderly people and people with disabilities [10].

### **4. DESIGNING ONLINE COMMUNITIES FOR ALL**

Although there are a number of similar definitions as to what constitutes an online community, a somewhat general approach can be deployed to define online communities as virtual communities composed of individuals who form and maintain online communication, share common goals,

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<sup>2</sup> TIDE TP1001 - ACCESS (Development platform for unified ACCESS to enabling environments, 1/1/1994 - 31/12/1996).

<sup>3</sup> IST-1999-20656 - PALIO (Personalised Access to Local Information and Services for Tourists, 1/11/2000 - 30/4/2003).

<sup>4</sup> IS4ALL: IST Thematic Network "Information Society for All" (IST-1999-14101). For more information see: <http://is4all.ics.forth.gr/>.

<sup>5</sup> COST219: Accessibility for All to services and terminals for next generation mobile networks. See: <http://www.tiresias.org/cost219ter/> for more information.

interests and needs that provide the reason of community existence, and use common interactive tools that support their networking and communication activities [14]. The term “networking”, is traditionally used to describe the formation and maintenance of connections and relationships between individuals, organizations or other interested parties. Virtual or online networking is a form of interpersonal communication that is characterized by the use of electronic means of communication between the different parties and the exchange of messages and information in electronic forms. Hence, virtual or online communities perform virtual networking. Essentially, online communities perform virtual networking through virtual collaboration spaces, which are becoming increasingly interesting both from a technological and a social perspective [3]. Three interrelated trends in the development of on line web-based communities can be recognised:

- Integration of services – an online meeting space as a portal providing access to a wide number of services
- Usability – online working space as a networked desktop of users at home, at the workplace, seminar room or on the move
- Personalisation – ability of the communication platform to adapt to the individual needs and characteristics of the users – community members

A key factor, which can be seen as an inherent characteristic of the above attributes and is actually a prerequisite for their existence, is the accessibility of the technology/platform/tool used by the community. The importance of designing virtual communication spaces that cater for a variety - if not all – of users becomes of particular importance, as accessibility to online communities also becomes crucial in ensuring accessibility to all citizens in the Information Society.

Design for All has the potential to remove the barriers faced by people with disability as well as the aged and other at-risk groups that are created by technology, thus contributing enabling independent living, socio-economic integration and quality of life. Moreover, in an increasingly information-based society, access to information is likely to determine the extent to which individuals or groups are able to engage and participate in societal activities [15]. Design for All seems to offer an attractive framework explicitly addressing access to information and services at all relevant levels (e.g., infrastructure, hardware and software).

But is it vital to follow DfA principles in an online community building process? A community's life can be thought of in four phases: pre-birth, early life, maturity and death [13]. In each stage, appropriate tools must be (re-)designed or selected to support the community activities in order to increase the willingness of individuals to stick with the group over time, and to stimulate them to take part in the (re-)development process. As an aftermath of community evolution and the rapprochement of group user needs, community members request resources and services using a range of software and hardware devices, including assistive technology. In order to address such evolving needs, the functionality offered has to facilitate the incremental growth in demand for information use. To sustain long-term access to a virtual community, the infrastructure supporting it should be highly modifiable, demonstrating a high degree of flexibility to facilitate the incorporation of changes, once the nature of the desired change has been determined [2]. In other words, as a virtual community develops and evolves, the needs of its members change.

Since the evolution of a virtual community is a constant process, it becomes increasingly necessary for its supporting operations to constantly reassess and meet the changing needs of its members. Such needs can be related to different ways of discourse, communication and information exchange, different accessibility and mobility needs, etc. Moreover, besides the evolvement of user needs as part of community maturation, online communities must be able to adapt to the increased degree of personal mobility of their members. Therefore, online community tools should also be

capable of incorporating next generation devices (e.g., PDAs, mobiles) and be able to support adaptable interfaces through terminals with different capabilities. Supporting the technical infrastructure that serves the needs of a constantly evolving online community can be a real challenge for designers and developers alike. More often than not, this can lead to large development costs and usually poor support performance, as community needs become ever more difficult to satisfy. In that respect, applying the principles of DfA is of crucial importance, not only in terms of designing and developing an infrastructure easy to support and further enhance, but also in terms of designing and developing an infrastructure that facilitates community operation and development.

## **5. ADOPTING DESIGN FOR ALL PRINCIPLES IN THE SERVICE OF ONLINE COMMUNITIES**

Although recent research in online communities has increasingly focused on the formation and operation of the communities in a social context [5], little research effort until today has stressed the importance of marrying technology with the social operation of online communities. In order to succeed, online communities need to meet the needs of individual members and maintain themselves over time. Nowadays, there are plenty of online platforms supporting online communities. But as in the past, when accessibility was mainly considered as an afterthought and reflected a reactive approach, in order to encompass redesign and redevelopment to meet changing technologies as well as user needs, significant costs have to be considered. In such environments, still Assistive Technology provides solutions with specialised input/output devices (e.g., Braille displays, switches, eye-gaze systems), however very often such solutions are not efficient. This programming-intensive approach towards accessibility increases the cost of implementing and maintaining accessible software, while rapid technological progress may render adaptations harder to implement, or obsolete by the time they are delivered.

The development of an online community requires major consideration, community participation and technical consideration. Supporting a community that continuously evolves, demands continuous re-examination and reconsideration in each stage, as developers may not even know how many people utilize the functionality offered. Such reconsideration requires a considerable investment for the re-development process. It is suggested that an optimal solution would be to provide universal accessibility engineering at an early stage during the design of a given application and services, because “accessibility is more expensive if introduced later in the design phase” [6]. In order to provide universal access:

- The software supporting the online community should be designed for the broadest possible end user population.
- A system should demonstrate high level of modifiability, so that any extensions in its functionality facilitate incremental growth in the scope of informational use and result to long-term access to an online community.
- Community members may utilize next generation technologies, such as 3G mobile phones, interactive TV services, etc. Platform scalability is important since online communities are likely to have long life-cycles and facilitate the informational and situational needs of users across different generations.

There are examples of cases, where the design of infrastructures to support online communities that are accessible and usable by all has taken into consideration the parallel process of development and evolution of the community they are built to support. HERMES, the web portal of EDeAN



(European Design for all eAccessibility Network), has been implemented by D4ALLnet project<sup>6</sup>, in order to support the virtual networking activities of the EDeAN Special Interest Groups (SIGs). Design for All emphasises that accessibility should be a design concern, as opposed to an afterthought. In other words, it is claimed that universal access entails proactive measures (i.e., methods, techniques, utilisation of appropriate tools, etc.) for the development of interactive products and services which can be used effectively, efficiently and easily by all users. The knowledge and experience gained during this process contributes to actually decrease the development effort for new modules (use of existing templates, consistent use of design metaphors). This user centred approach has been followed for the design and implementation of the HERMES web portal. The aim was to develop a highly interactive, accessible and usable tool. HERMES, the EDeAN web portal, currently supports all virtual networking activities of EDeAN through the provision of accessible facilities to enable the operation of the EDeAN Special Interest Groups (SIGs) and it is fully operational since July 2004, available at the url address <http://www.edean.org>. It can be argued that the EDeAN virtual networking infrastructure, by providing an accessible virtual collaboration platform, has already significantly contributed towards the creation of a DfA community in Europe, sharing common interests, working under similar objectives and expanding the principles of DfA to a wider audience in Europe.

In addition, for the formulation of the online community comprising of the EDeAN SIGs, a community-centered development process have been followed [10]. Such process ensured that:

- Community needs were assessed prior to making decisions about the technology
- Web user interfaces would be platform-and-user-profile independent, and could be adapted to the individual end user abilities, skills, requirements and preferences.
- Re-examination of policies and purpose of community (i.e., different registration procedures, open vs. closed discussion fora, need for additional tools and accommodation of new needs), with the active participation of the community, would not require technically more difficult and programming-intensive support, while maintaining accessibility level at the highest level.

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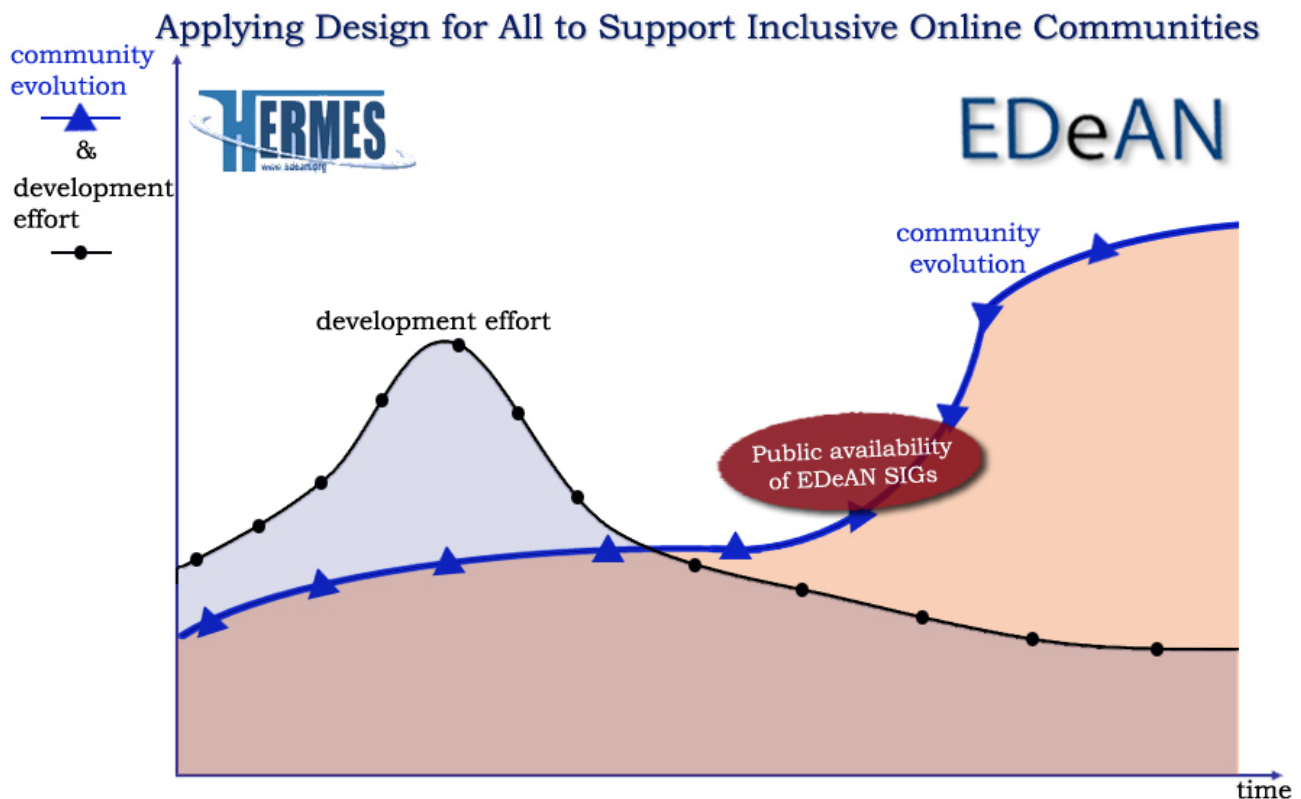
Particularly, in the case of HERMES, although the portal was initially used by a small group of people, mainly participants of the D4ALLNet project and a few representatives of EDeAN National Contact Centres, as the EDeAN community developed, new functionality had to be added to support the increasing needs of its growing number of members (new EDeAN members, general public, etc). Thus, HERMES has undergone a number of modifications and enhancements that were not originally planned for, but had to be met in the course of its operation as the online communication tool for EDeAN. For example, the SIG message board, and the users' registration procedure had to be modified and partly re-developed more than twice, new facilities had to be created and new ones will soon follow, as a result of continuously trying to meet the changing user needs.

Figure 1 below illustrates the interface development effort needed to meet the changing needs of the EDeAN community, in the course of its development. It can be seen that although the community developed and its size increased significantly (thick line) with the involvement of new community members, the development effort (thin line) needed to support the necessary software enhancements for the HERMES platform gradually decreased, as a result of the design principles followed. The development effort is high at the early stages of HERMES lifecycle, as increased

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<sup>6</sup> IST-2001-38833 – Design for All Network of Excellence (<http://www.d4allnet.gr>)

resources have been used in order to apply DfA principles right from the beginning. As the development needs change over time, the effort necessary to carry them out is actually decreasing.



**Figure 1:** Applying Design for All to support Inclusive Online Communities

## 6. CONCLUSIONS

This paper has discussed the adoption of Design for All as a user-centred design methodology in the context of developing communication tools for online communities, arguing that it can support the creation, operation and evolution of an online community throughout its lifecycle. By following a DfA methodology early in the development of an online community tool, the changing user needs can be effectively addressed in a continuously evolving environment such as a virtual community, without imposing additional costs in terms of resources and development effort needed. In that respect, the HERMES portal can be seen as a good practice example for the design and development of an infrastructure that supports the operation of online discussion groups - online communities accessible by all users irrespective of their physical ability, experience in the use of ICT and their location.

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