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Opportunities and Challenges of Digital Technologies for Inclusion

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Abstract. Digital technologies are profoundly changing our daily life and our society more in general. This transformation brings new opportunities and challenges also in terms of inclusion. Indeed, some technologies can present barriers in terms of adoption and accessibility; for this reason it is important to elaborate new methodologies that can guide the design process in order to be more inclusive. At the same time, digital services and products can empower citizens to fight social exclusion, or assist people with disabilities for enabling them to perform activities that they have not been able to do before, or to increase participation of disadvantaged people in social and economic activities. This paper shows the current trends in terms of design applied to digital technologies and highlights the importance and urgency of this topic calling all researchers from academia and industry for action to leverage "design for all" methods in order to increase inclusion in our connected world.

Keywords: Digital Technologies, Inclusive Design, Design for All/Universal Design, Human-computer Interaction.

1. Introduction

Inclusive design is a complex matter presenting multiple facets and this session aims at sharing experiences and debating on how digital technology can be leveraged to provide universal access to people, empowering diversity and overcoming cognitive and physical barriers, such as cultural and societal differences in this connected world. Identifying new opportunities and challenges in leveraging digital technology to foster inclusion requires bringing together researchers from academia and industry and practitioners to create a multidisciplinary community interested in facilitating knowledge transfer and synergy, the connection, the gaps between the different research domains, paving the way for common purposes.

A symposium is the perfect platform to showcase good practices and discuss future directions for the development of digital solutions for inclusive design, where interactive exchange of ideas and opinions will be encouraged and valued.
The impact of digital technologies is affecting the world of research and industry, in the field of products, public and private services and the fruition of cultural heritage, investing also in the Human Factors and Ergonomics domains. It is no coincidence that the IEA has dedicated the 2021 conference to the general theme of "HFE (Human Factors and Ergonomics) in a connected World and on Ergonomics 4.0".
It is therefore very important to address the issue of digital technologies for inclusive design, so topical, in a multidisciplinary way in order to have a vision from different perspectives and open a discussion on the topic.

2. Digital Technology Impact on Design for Inclusion

Digital technologies have transformed the contents and tools of design and manufacturing, but they also create different ways for end users to use spaces, architectures, objects and services, facilitating interaction, security and creating innovative transmedia communication modality.
Inclusive Design is neither a new genre of design nor a separate specialism, but it is a general and transversal design approach that can be applied in various design sectors, from communication systems to built environment, from services to product-service system, so that each environment/product/service can be used by as broad a range of population as possible [1,2].
Terms such as "inclusive design", "design for all", "universal design", "accessible design", "barrier-free design", and "transgenerational design" are often used interchangeably with the same meaning. They share a similar inclusive design philosophy, that is designing, developing, and marketing products, environments, programmes and services to be accessible and usable by as broad a range of users as possible, without the need for adaptation or specialized design. ID does not exclude assistive devices for particular groups of persons with disabilities where this is needed. ID is explicitly cited in British Standard, UD is considered as the necessary approach to grant accessibility in UNCRPD art.2, DfA is applied in EU standards [3]. The adoption of these approaches brings forth on two concepts which should be based on design targeting the widest possible range of user capabilities: accessibility and usability [4-11]. Accessibility refers both to the process of design, in that it is a goal, and to the product of the design process, in that it provides a basis for measuring the extent to which the product can be used. It is a concept that relates to the interaction between the user and product or service, expressed in terms of the achievement of task goals. The concept of usability is associated with the interaction between the user and the product and not with the product in itself. Increasing the quality of interaction is considered fundamental for the goal of increasing the levels of accessibility achieved in software products. The concepts of accessibility and usability overlap and are interdependent, as well as a product that cannot be used to achieve task goals is never going to be effective, and therefore is neither usable nor accessible. It is important to understand in relation to these two concepts the context of use and the context of design.

Aging and the various social changes of today challenge designers to design products, services and environments that take into account the largest range of users possible [12]. This means addressing the diversity of the population, in the design process and design goals, that derives from differences in age, gender, ability, ethnicity, profession, culture, language, nationality, situation, etc. In this context, digital technologies have a fundamental role in terms of interaction with our surrounding world. The development of digital technologies and their diffusion in the fabric of everyday life, through the application to everyday products such as: household appliances, furniture for indoor and outdoor environments, communication devices, services, just to name a few, are changing the modalities and the Design of interaction, towards a better quality of life, both individually and collectively. There are many researches and studies on the use of digital technologies, in various academic sectors, that address human diversity in design of product, services and built environments, with the view to Design for Inclusion. For example: smart urban furniture aimed at facilitating cultural diversity interaction [13, 14]; smart habitat for the eldery [15, 16], addressing the challenge of migrant integration through ICT-enabled solutions [17], increasing interaction between people through technology [18, 19].

We find ourselves taking advantage of the many possibilities offered by the digital transformation that has affected all areas of our life. The ubiquitous computing that is pervasive in the urban environment; Internet of Things and artificial intelligence, which make home living environments and not only interactive and adaptive; wearable devices, smart fabrics, smart garments, often used for health and stress monitoring; real-time communication technologies, which make us continuously connected to the virtual environment and find all the necessary answers in real time. Those are some of the technological opportunities that a designer faces when exploring possible new scenarios to increase the quality of life and well-being of people and their habitat. Targeted at inclusion, these technologies can help to address the various challenges that society is facing today. On the one hand, for example, the aging of the population, with a growing demand for new solutions aimed at the most fragile groups of users, such as the elderly, with temporary or permanent physical and cognitive disabilities, to extend their autonomy and health for longer possible, or to assist them in daily tasks. On the other hand, the migratory flows of people from different countries and the globalized society, with the consequent demographic, cultural, political, and economic transformation of urban areas. This phenomenon brings out new barriers linked to the diversity of culture and of cultural levels, to social and gender barriers.

Last but not least, another challenge is the overcoming of the transgenerational digital divide, an issue that, if not addressed in an inclusive manner, could lead to the exclusion of the less young and less digitized users from many digital services.

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