

LEARNING EXPERIENCE DESIGN

Embracing human diversity through educational technology

Alessia Brischetto



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Alessia Brischetto

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«Our ability to reach unity in diversity will be the beauty and the test of our civilisation».

Mahatma Gandhi

Foreword - Design for learning: the project for inclusion

by *Francesca Tosi*

Information and Communication Technologies - ICTs and digital technologies in general are tools in continuous and rapid expansion. The interactivity offered by computers, tablets and smartphones today is increasingly promoting an expansion of human capabilities never seen before in history, and in a remarkably short period of time. Virtually, every aspect of our lives has a digital dimension. Very important, technologies foster the exchange of information between individuals and have also been identified as one of the most important factors in reducing social gaps, supporting social inclusion and increasing people's quality of life. Contemporary computer systems (from the 2.0 era), if well designed, can by their nature enable all people to access information, regardless of their physical or cognitive characteristics, and of the hardware and software tools they use.

However, the themes of social inclusion and social innovation involve very broad user profiles, united by the need to safeguard and improve their own levels of personal autonomy in their living environment (domestic, urban, collective), and of participation in active life and social life. It is therefore for several reasons that ICT are not yet effectively exploited in the promotion of social inclusion for people with disabilities. Although significant progress and efforts have been made, also in terms of international policies, only a few researches are dedicated to examine all the aspects necessary for the design and development of technologies that are truly aimed at inclusion for all. Even more, it is worth mentioning that there is a limited number of studies focused on how social inclusion for people with disabilities can be facilitated through the development of technologies and new applications. The most challenging questions that the research world tries to answer are: how can social inclusion be facilitated through the use of ICTs? Can ICTs contribute to enhance the value of individuals' differences? Has the use of ICT produced forms of social exclusion? What are the effective measures to be taken to assess the inclusive potential of ICTs?

On these issues, which focus on the needs (needs, expectations, desires) of people within their context/living environment, the contents and objectives of this book converge. Specifically, in this broad panorama, the author addresses the issues described above, paying particular attention to digital learning technologies used in training contexts. The book illustrates research perspectives today considered open within the training sector facing European and international challenges. The European community itself states that the substratum of ICTs, allows to significantly transform the articulation of productivity, opening to disabled people the possibility of social integration. The use of technologies for disability (and not only) in educational contexts touches simultaneously didactic-methodological and technical issues regarding the choice of devices. In this sector, ICT, for its own characteristics, would seem to have strengths in three aspects including “motivation, rigour, adaptability”.

Moreover, the use of the computer, thanks to its flexibility, allows the customization of training paths and processes, playing on each one’s learning styles and rhythms. However, people are not always easily able to carry out predetermined tasks and activities, as there have been difficulties in accessing information, especially because the tendency is to provide assistive technologies for learning.

Within this framework, the aim of this book is to contribute to the development of solutions that are genuinely respectful of human diversity by exploiting the methods of the Design disciplines, but without neglecting the contribution of all other disciplines. Therefore, with a top-down/bottom-up procedure, the author provides in the first chapters an accurate analysis of the main international policy strategies aimed at the development and integration of inclusive learning practices, the psychological-cognitive aspects involved in human-machine interaction, the theories and learning models mediated by ICTs, and the technologies developed so far in the field of Educational Technologies. All the aspects examined have subsequently been integrated with web accessibility standards, the Ergonomic/Human-Centred Design approach, and, more generally with the Design for Inclusion.

After a solid research, in the final chapter of the book, web platforms for learning are presented and validated, trying to highlight advantages and criticalities with respect to the following features: access to the information to be studied, text comprehension, re-elaboration of information, storage and recovery of contents. From these are finally reported a series of design ideas necessary for the development of training paths within which the skills of each individual are enhanced to achieve a specific goal.

Introduction

Learning in the digital age means having user-friendly and interactive systems capable of creating a series of new relationships between man and technology. In this regard, the Design is called to face, more and more strongly, with different disciplines, from the engineering-informatics to the humanistic-social ones. Therefore, it is necessary to adopt a bottom-up multidisciplinary approach, within which the design field interfaces with increasingly complex design dimensions. In recent years, computer accessibility and aspects regarding the use, distribution and visualization of contents, not only informative but also educational, became issues of great importance within the technology market, particularly within the Educational Technologies sector.

In the modern society, the knowledge, its acquisition process and fruition are related to new forms of complexity, strictly connected to digital innovation, to the frequent use of network devices for sharing information and most in general, to the massive widespread of technology in everyday activities.

On the one hand, technologies can reveal a valid tool for promoting individual residual skills of weakest people (elderly, disables and children) as well as be able to overcome impairments or defects, especially in those situations where people with disabilities and/or with partial or temporary learning limitations are present. However, people are not always able to accomplish their tasks or earlier determined activities, because tools or devices needed to acquire information are often poorly designed and they do not consider the specific needs of people. To address the shortcomings imposed by the fast growing of technological devices, new design solutions are increasingly required as well as a continuous redefinition of the goals to achieve in the projects together with the daily updating of methods and involved stakeholders.

Starting with the knowledge related to Ergonomics in Design and inclusive design, this book aims to provide an opened and integrated point of view

to the disciplines of cognitive psychology, pedagogy and Human-Computer Interaction (HCI). It configures as a flexible tool for the understanding of the key aspects concerning the use of technologies and their effects, with special regards to the experiential dimension on a human scale, particularly focused towards weaker people.

The book is supported by interviews to experts, which are focused on the sharing of expertise, experiences and methodologies. It is also displayed a collection of operating case studies with the aim of providing concrete design tools and to stimulate the development of novel designing scenarios for promoting social inclusion and valorizing human diversity.

To face with this issue, within the framework of Educational Technologies, assistive and adaptive systems, including a broad range of technological devices (hardware, furniture, computer screens, software and so on), are usually employed to enable anyone to interact with more easily and effectively, regardless of any impairment or disabilities. Similarly, Learning Management System (blended Learning, *e-learning*, etc.), born as electronic educational technologies, are largely used nowadays as networking environments to promote the integration and guide learning through flexible architectures based on current standards of web accessibility, platforms and content format. However, it is noteworthy that the main limitation of these systems is ascribed to accessibility. This causes social exclusion, as it makes more difficult the access to information of people with different types of impairments. Despite the significant efforts, the accessibility of *e-learning* and web platforms and the use of assistive technologies are issues not entirely addressed yet. With this in mind, the present work studies how Design and related operational methodologies may support the process of analysis and development of complex digital products, which should be as much as possible inclusive.

The *chapter 1* describes the aspects of social inclusion and the use of technology in learning environments. To the aim, it reports the most important readings of contemporary society, including those of Rifkin, Bauman and Castells, which argue that the technologies, if properly adopted, can promote the production and dissemination of knowledge fostering democracy and social-economic and cultural development. Technologies, particularly in the educational field, have long been seen as a resource, especially in those situations where disabled users and/or people with partial or temporary learning limitations are present. Among these discomforts, difficulties due to social and cultural factors are also included. Likewise, the concept of disability has changed, opening up new visions in contrast to the traditional models.

It follows that the learning technology dimension, widely debated over time, may prove, for certain aspects, as a resource in the relations between individuals rather than a limiting factor.

This aspect will be investigated and argued in the concluding part of the chapter, with the aim of tracking the pros and cons along with the best practices to be adopted in the development of eco-friendly learning environments at human scale.

The *chapter 2* describes within the educational field, like new technologies have long been seen as a resource, especially in those situations where disabled users or people living in conditions of discomfort are present. This chapter brings together the strategies and policies adopted in recent years at European and international level, both in relation to social inclusion and educational technologies, to address the above-described issues. Furthermore, it provides information on how to intervene, on the disciplines involved and the most innovative experiments carried out for promoting social inclusion.

The *chapter 3* analyses the cognitive aspects necessary for the design of learning environments. In particular, it deals with the development of technologies between theories of learning and progress of the machines.

Beginning with the birth of the Educational Technology and the evolution of its meaning, the learning theories, born in synergy to developing technologies and the human-machine interaction, are analysed and described. In particular, the early theories of Skinner and Crowder on behaviourism up to the most modern of cognitivism and constructivism are reported. These practices, which have enabled the development of new models and ways of teaching, will be illustrated through the analysis of conceptual maps and tables, with the aim of tracking the project areas, the margin of innovation and focusing on what professional skills are called into question.

It follows a reflection on the tangible learning dimension, and on the influence and implications that cognitive psychology and modern pedagogy can play. This last part involves experts, which will contribute to the drafting of the chapter.

Chapter 4 gives an overview of disciplines and design methods. Design and develop learning experiences, it means actually focusing on the humans and their needs. This chapter aims to draw what are the disciplines and methods useful for the design of learning environments on a human scale.

In a broad sense, when we speak about interaction and learning the disciplines involved are multiple. Basically, the core of contemporary research

is identified in those disciplines dealing with “Human Factors”. The wide spectrum of disciplines involved determines a new dimension of knowledge and opens a complex framework of intervention, in which design can play a strategic role. In particular, the theoretical knowledge of design and its operational tools will be described and illustrated in reference to the learning experience design.

The *chapter 5* gives an overview towards with strategies for designing inclusive learning experiences. What actually means learning is a complex issue. The learner enters into a relationship with a number of agents, which in turn are characterized by a series of features that are defined channels of learning. The latter stimulate the learner to acquire information and transform them in experiences. This form of relationship in some way can be called human-system interaction of meta-cognition. Can this interaction be designed? If yes, how? What operational and methodological tools do we need? The chapter collects the most promising methods among those considered and in its final part proposes a hybrid methodology for the evaluation of learning and guiding the design phase.

The *chapter 6* presents the experiments carried out on the field, through the presentation of two case studies, named *VLAll* and *Moodle*. With the aim of illustrating the procedural rules and intervention described in *chapter 5*, the building of the case studies is based on co-design practices, where organizations and professionals involved in the sector education and disability. The main subject of the investigation are the end users, particularly children and individuals with specific learning disabilities.

With reference to the operational stage provided in *chapter 5*, this section is intended to provide to the reader, design ideas through a collection of possible scenarios of intervention. This was made possible by applying the methods of Human-Centred Design, which involve expert evaluation, Task Analysis, user observation and Thinking Aloud, interview and questionnaire, and Focus Group whit users. The proposed scenarios will be validated through co-design practices, where stakeholders and experts working in the field are jointly involved.

1. The contemporary dimension of inclusive learning

1.1 Introduction

In a knowledge-based society, technology, from personal devices to the network, is increasingly the mean to transmit, store and produce information.

Therefore, it follows that accessibility to technology becomes a fundamental requirement in the way we live, work and learn.

In spite of this, it has been observed on several occasions that while Information and Communications Technology (ICT) makes it possible to access what has hitherto been inaccessible, offering considerable opportunities, it can simultaneously generate problems of social exclusion for vulnerable groups, such as disabled, foreigners and elderly people.

For some time now, free market laws have been orienting most of products to groups of users belonging to the category of people without disabilities, thus excluding all those who have special needs and who can hardly adapt to technology. In the face of the development of the so-called “digital highways”, it is also necessary to avoid that the diffusion of technologies is dictated by a purely economic logic. This not only for reasons of social equity, but also for avoiding, in the next future, the payment of high social and economic costs needed to provide an equitable access to the weaker categories (Kozma, 2005; Mishra et al., 2015).

In this age of technological innovation, anyone can potentially become the author of information to be used for learning, even without being an expert in making such information accessible. It is important that everyone is aware that information may not be accessible to different categories of users in the way it is presented.

Today, the World Report on Disability - WHO, states that over one billion people, about 15% of the world’s population, suffer from some form of disability. In addition, between 110 and 190 million adults have significant functional difficulties and disability rates are increasing due to the ageing

population and increasing chronic diseases (WHO, 2016). Last, around 15% of the world's population has no access to information unless it is made accessible.

There is therefore a need to implement specific policies based on a strong sense of social and civil responsibility, aimed at ensuring that people with disabilities can live independently and participate fully in all aspects of daily life. In this sense, the European Community through the i2020 initiative, which is linked to the Lisbon Strategy, has been actively involved in the creation of a single information space.

With the aim to develop specific proposals and achieve a European Information Society based on inclusion: "e-inclusion, e-accessibility, European Action Plan, ICT deployment policies" a significant investment has been foreseen for research and development in the field of ICT (Berleur and Galand, 2005; Jarke, 2015).

Within this complex framework, if the accessibility and use of information is guaranteed, ICTs can go even further, as can be a valid tool to enhance the residual capacities of people with disabilities and to make up for "shortcomings" (Seale and Cooper, 2010). It is for these reasons that within the educational sector, ICTs have long been viewed as an important resource.

To date, shared practices to facilitate the fruition and access of people with disabilities include as a primary resource the use of assistive technologies such as aids, monitors, hardware and software devices. Nevertheless, the United Nations Convention on the Rights of Persons with Disabilities encourages the importance of undertaking or promoting research, development and use of new technologies, goods, services and equipment in a wider perspective of universal design, overcoming the limits imposed by the so-called functional prostheses or better defined "assistive technologies" (Lazzari, 2012).

Universal Design, and more specifically the design approaches of Design for All and Inclusive Design assume a strategic role and therefore become an indispensable element through which, in a systematic and proactive way, it is possible to develop solutions accessible to all citizens in an inclusive perspective.

Thus, in the ICT sector, the flexibility that characterizes the products-systems allows relating effectively the needs of disabled people with the experiences of generic users. A major understanding of this aspect may be achieved by referring to the parallelism elaborated by Vanderheiden (2001), which relates the requirements of the instruments used by a visually impaired person (assistive technologies) and the characteristics of portable technologies. In both cases, systems to adjust the text size are used. Similarly, people

with motor difficulties use voice command tools while hands are engaged in other activities.

This convergence, between assistive and portable technologies, highlights the importance of adopting an integrated design capable of implementing new technologies, whose technical and functional specifications meet adaptability and flexibility requirements.

1.2 Socio-technological background

An incessant technological revolution is transforming contemporary society in a radical way. In this scenario, new technologies and ICTs are a driving force of that set of processes called globalization.

We live in what Rifkin (2006) called the *Age of Access*. In today's network society the term "access" has become the key to enter into existence and not remain excluded, to be protagonists in the contemporary reality where property has given way to access. The ongoing transformations are evident on several fronts. If the trading economy is characterized by the sale of products, in the economy of cyberspace, "things" are no longer sold but rather we rent services and experiences. This change is leading to radical consequences, especially on the culture, that in this framework, becomes the most precious of goods. Intelligence and ideas are the first to be "rented", subordinated to trade, profitability and the demands of the new market.

On this background the digital exclusion or *digital divide* arises. To deal with these issues, a new form of wealth is thus emerging, and it is characterized by the possibility of accessing those same goods, services and information. There is an increasing growth of virtual places on the network where one can acquire knowledge, therefore "wealth" (but not only), independently of the real ownership of that good. In this process the network represents a powerful tool, as it allows all citizens to be provided with the necessary sources of knowledge for building new opportunities and participate in the economic, social and cultural development of the community.

Today, many aspects of social life are carried out on the network and consequently, those who remain excluded from this new relational environment cannot achieve the effective realization of some of fundamental rights reported in the *Universal Declaration of Human Rights* (1948)¹. The Art. 19 refers to the right of each individual of: «seek, receive and disseminate

¹ World Report on Disability (WHO), Disability Report. See: www.who.int/news-room/facts-in-pictures/detail/disabilities.