Advances in Intelligent Systems and Computing 587

Giuseppe Di Bucchianico
Pete F. Kercher *Editors*

Advances in Design for Inclusion

Proceedings of the AHFE 2017 International Conference on Design for Inclusion, July 17–21, 2017, The Westin Bonaventure Hotel, Los Angeles, California, USA

Springer

Advances in Intelligent Systems and Computing

Volume 587

Series editor

Janusz Kacprzyk, Polish Academy of Sciences, Warsaw, Poland
e-mail: kacprzyk@ibspan.waw.pl

About this Series

The series "Advances in Intelligent Systems and Computing" contains publications on theory, applications, and design methods of Intelligent Systems and Intelligent Computing. Virtually all disciplines such as engineering, natural sciences, computer and information science, ICT, economics, business, e-commerce, environment, healthcare, life science are covered. The list of topics spans all the areas of modern intelligent systems and computing.

The publications within "Advances in Intelligent Systems and Computing" are primarily textbooks and proceedings of important conferences, symposia and congresses. They cover significant recent developments in the field, both of a foundational and applicable character. An important characteristic feature of the series is the short publication time and world-wide distribution. This permits a rapid and broad dissemination of research results.

Advisory Board

More information about this series at http://www.springer.com/series/11156

Giuseppe Di Bucchianico
Pete F. Kercher
Editors

Advances in Design for Inclusion

Proceedings of the AHFE 2017 International Conference on Design for Inclusion, July 17–21, 2017, The Westin Bonaventure Hotel, Los Angeles, California, USA

Springer

Editors
Giuseppe Di Bucchianico
Dipartimento di Architettura
Università degli Studi
"G.d'Annunzio" Chiet-Pescara
Pescara
Italy

Pete F. Kercher
EIDD - Design for All Europe
Oliveto Lario
Italy

ISSN 2194-5357 ISSN 2194-5365 (electronic)
Advances in Intelligent Systems and Computing
ISBN 978-3-319-60596-8 ISBN 978-3-319-60597-5 (eBook)
DOI 10.1007/978-3-319-60597-5

Library of Congress Control Number: 2017943023

Printed on acid-free paper

This Springer imprint is published by Springer Nature
The registered company is Springer International Publishing AG
The registered company address is: Gewerbestrasse 11, 6330 Cham, Switzerland

Advances in Human Factors and Ergonomics 2017

AHFE 2017 Series Editors

Tareq Z. Ahram, Florida, USA
Waldemar Karwowski, Florida, USA

8th International Conference on Applied Human Factors and Ergonomics and the Affiliated Conferences

Proceedings of the AHFE 2017 International Conference on Design for Inclusion, July 17–21, 2017, The Westin Bonaventure Hotel, Los Angeles, California, USA

Advances in Affective and Pleasurable Design	*WonJoon Chung and Cliff (Sungsoo) Shin*
Advances in Neuroergonomics and Cognitive Engineering	*Carryl Baldwin*
Advances in Design for Inclusion	*Giuseppe Di Bucchianico and Pete Kercher*
Advances in Ergonomics in Design	*Francisco Rebelo and Marcelo Soares*
Advances in Human Error, Reliability, Resilience, and Performance	*Ronald L. Boring*
Advances in Human Factors and Ergonomics in Healthcare and Medical Devices	*Vincent G. Duffy and Nancy Lightner*
Advances in Human Factors in Simulation and Modeling	*Daniel N. Cassenti*
Advances in Human Factors and System Interactions	*Isabel L. Nunes*
Advances in Human Factors in Cybersecurity	*Denise Nicholson*
Advances in Human Factors, Business Management and Leadership	*Jussi Kantola, Tibor Barath and Salman Nazir*
Advances in Human Factors in Robots and Unmanned Systems	*Jessie Chen*
Advances in Human Factors in Training, Education, and Learning Sciences	*Terence Andre*
Advances in Human Aspects of Transportation	*Neville A. Stanton*

(continued)

(continued)

Advances in Human Factors, Software, and Systems Engineering	*Tareq Z. Ahram and Waldemar Karwowski*
Advances in Human Factors in Energy: Oil, Gas, Nuclear and Electric Power Industries	*Paul Fechtelkotter and Michael Legatt*
Advances in Human Factors, Sustainable Urban Planning and Infrastructure	*Jerzy Charytonowicz*
Advances in the Human Side of Service Engineering	*Louis E. Freund and Wojciech Cellary*
Advances in Physical Ergonomics and Human Factors	*Ravindra Goonetilleke and Waldemar Karwowski*
Advances in Human Factors in Sports, Injury Prevention and Outdoor Recreation	*Tareq Z. Ahram*
Advances in Safety Management and Human Factors	*Pedro Arezes*
Advances in Social & Occupational Ergonomics	*Richard Goossens*
Advances in Ergonomics of Manufacturing: Managing the Enterprise of the Future	*Stefan Trzcielinski*
Advances in Usability and User Experience	*Tareq Ahram and Christianne Falcão*
Advances in Human Factors in Wearable Technologies and Game Design	*Tareq Ahram and Christianne Falcão*
Advances in Communication of Design	*Amic G. Ho*
Advances in Cross-Cultural Decision Making	*Mark Hoffman*

Preface

This book has two underlying messages, the emerging importance of the social issue of inclusion and human diversity in contemporary society, and the increasing awareness that there is no such thing as a 'standard human being.' The first question is considered to have a primarily political repercussion. US President Obama spent his mandate championing inequality and social disparity as a necessary milestone toward economic revival, among other things, while a vital role in the strategies adopted by the European Union's Horizon2020 framework program is played by the ones that focus on strengthening equality, participation, and accessibility for all to goods, services, and what Dahrendorf called 'life chances.' What this means is that the issue of social inclusion of diversity and for equality is firmly on political agendas all over the world, not least because of increasing awareness that new visions, new strategies, new tools, and new approaches are needed, if we are to tackle the challenges arising from recent phenomena of economic and cultural globalization, demographic change; economic migration from poorer countries and an ageing population in wealthier countries, a phenomenon that is destined to upset the entire planet's micro- and macro-economic and social structures in years to come.

The second issue tackled in this book is more technical in nature, since the paradigm changes from 'designing for standards' and 'inclusive products and service design' to the enlightened awareness that there are no such concepts to fit the standard human being, and this has immediate, direct repercussions on the specialized dimension of designing. The realization is at last taking hold not only that those individuals are physically, psychologically, and culturally 'diverse,' but they also have widely diversified skills, abilities, aspirations, and desires that make each one of us unique and not at all replicable. Since the diversity of individuals is the rule, not the exception, it makes sense to consider it as a resource, not as a limiting factor or a restriction on design, while equality between individuals, communities, and peoples should be treated as fundamental strategic inputs to the sustainable development of contemporary society, where everybody should have the same opportunities to experience places, products, and services. Numerous design approaches have been adopted to facilitate social and cultural inclusion in recent decades: Design for Disability, Universal Design, Inclusive Design, and

Design for All. All of these philosophies, approaches, and methodologies aim to build value on all aspects of human diversity, from psychophysical to cultural issues, and to offer equal opportunity to everyone in order to experience places, products, services, and systems. With this in mind, this book sets out to forge a climate conducive to discussion and comparison between these approaches, without any prejudice in favor or against any one of them, but attempting to identify the elements they hold in common and to build each one's heritage of originality, because we are convinced that the true resource of Design for Inclusion may well be found in this very diversity of opinions.

In particular, this book describes the state of the art of recent research conducted in a variety of fields that share the focus on Design for Inclusion and was presented in the second international conference on Design for Inclusion (AHFE 2017, Los Angeles, California). On this occasion, the numerous research papers presented were collected together into seven different thematic areas, corresponding to different sections of this book:

- Design Driven Social Innovation: Methodology and Training;
- Advances in Design for Ageing Population;
- Inclusive Products and Service Design;
- Smart Tech, Web and Media for All;
- Design for Inclusion in the Living Environment;
- Inclusive and Universal Design in Clothing, Footwear and Accessories;
- Design for Users With Disabilities.

Each section contains research paper that has been reviewed by members of the International Editorial Board. Our sincere thanks and appreciation to the board members as listed below:

July 2017

Giuseppe Di Bucchianico
Pete Kercher

Contents

Design Driven Social Innovation: Methodology and Training

Challenges to Teaching Empathy in Design

Young Mi Choi(✉)

Georgia Institute of Technology, 245 4th Street NW, Atlanta, GA 30332, USA
christina.choi@design.gatech.edu

Abstract. This paper will discuss some of the challenges of teaching students to build empathy and learning how to utilize it within a design project. It will discuss challenges encountered within two college level classes: an industrial design studio and in a class on human factors and ergonomics. Two project examples will be presented for the studio, a universal design project and a project to design an assistive device. An example of an empathy activity used in the lecture based human factors class is presented.

Keywords: Empathy · Education · Product design · Universal design · Assistive technology

1 Introduction

This paper will discuss some of the challenges of teaching students to build empathy and learning how to utilize it within a design project. It will discuss challenges encountered within two college level classes: an industrial design studio and in a class on human factors and ergonomics. The aim of the studio project discussed is to utilize user centered design strategies to design a product to meet a specific need for users who have lost a specific physical function. In particular, the creation and use of simulation methods were employed to put students as closely as possible into the shoes of the user. One of the project aims is allow students to gain a better understanding of the physical challenges encountered by some users. It also seeks to build empathy to allow better insight into less tangible issues that arise from living in a world designed with the missing function in mind. Students were assigned to a condition (such as limited vision, a missing limb such as an arm, conditions related to age, etc.) and a scenario that a user with that condition might encounter (such as buying food at a cafeteria or purchasing an item at a bookstore). Their challenge is to identify how to simulate it, perform the task, identify a problem or issue related to it, and then design a product to address that specific issue. The students had to employ multiple research methods to understand the environment and task, discover issues actual encountered by users and then address them. Within the human factors class, students take part in an empathy exercise early in the semester. The aim is to get students into a default mindset where they are looking for and considering issues that they may not personally have in common with others as the course material is presented. At the end of the semester a final design project to design the interior of a micro-car is given.

G. Di Bucchianico and P.F. Kercher (eds.), *Advances in Design for Inclusion*,
Advances in Intelligent Systems and Computing 587, DOI 10.1007/978-3-319-60597-5_1

In both cases, students still often default to their own assumptions. This tends to happen even if a core part of the assignment is to explicitly try to research and replicate a condition that is unfamiliar. Data collected from both projects in the form of student surveys as well as the outcomes of the delivered assignments will be presented. The paper will discuss how the projects have evolved over multiple semesters to improve them. The successful changes and potential future enhancements will be discussed.

In 1997, a group of experts developed the Seven Principles of Universal Design that are commonly used today as a process for defining and evaluating design elements [1]. This group defined universal design as "the design of products and environments to be usable by all people, to the greatest extent possible, without the need for adaptation or specialized design [2]. "Universal design, in practice, will ensure that more people with varying abilities will have a better chance to benefit from products. Design schools in the United States have been slow to adopt Universal Design. It is increasingly important for future designers to consider broader needs in all products as the number of people who will experience some level of disability is forecast to increase dramatically [3].

Another key element of this learning process is enabling students to interface with potential users, especially those with disabilities [4]. This experience allows student to develop confidence in their ability to interview people who may have differing needs and to solicit feedback on their designs or even involve such individuals in their design process, through participatory design. This experience is also important in developing empathy with groups of users that may have fundamentally different needs and experiences with the world. Without attempting to put themselves in the shoes of other users to better understand their viewpoint, it is less likely that designs will be effective at meeting needs that are outside of the designer's assumptions.

2 Design Projects

Sophomore industrial design students undertake a series of three to four projects in their second semester studio course. All of the second semester projects have a focus on collecting, understanding and meeting user needs. Projects start focused on a single user and move to focusing on different groups of users. In particular, the students undertake a universal design project followed by a project focused on designing an assistive product for a specific disability group/scenario. The studios that undertook the projects described were divided into three sections, each comprised of 12–18 students taught by separate instructors. One of the goals of both is to build empathy with the target user groups.

Students undertook the universal design project in teams of 3–4 over a timeframe of five weeks. Student teams were assigned a specific group of users to consider in their universally designed product: either users with mobility limitations or users having limited vision. For this project mobility limited users were defined as those who rely on the use of a manually operated (as opposed to powered) wheelchair. Vision limitation was defined as less than 20/20 vision up to and including legal blindness.

A total of 10 teams in two sections were assigned the mobility problem while 5 teams in one section were assigned the limited vision problem. The goal of the project was to

design a shopping device with mobile/wireless enabled features to address the needs of the general population in addition to the assigned user group. All designs were required to help users to locate desired items, transport items around the store, checkout and to transport purchased items to a user's vehicle. Presentations were given at the start of the project to introduce students tothe concept of Universal Design, on how to approach inclusive design, how to develop personas and how to conduct effective usability testing (formative and summative).

A defining feature of the universal design project is that the students get a chance to interact with actual users in an organized way. User visits were arranged for three different points during the project. The first visit was in the second week. This gave students a chance to perform some background research and prepare. The first visit was organized as a panel discussion where all students were able to ask questions of a user panel made up of 7–8 users for mobility and three users for vision (Fig. 1). This allowed all students to benefit from hearing answers and participating in discussions. The next visit was arranged just past half way through the project. Students were required to create a testable mockup of their initial solution, test it with individual users and obtain feedback. The final visit was scheduled the week before the end of the project. This was to allow students to test their final designs with users to measure performance and satisfaction with the design. Teams were encouraged to collect needs and perform testing with other user groups outside of class.

Fig. 1. Students questioning users at the start of the universal design project. Vision limited users (left) and mobility limited users (right).

The assistive design project is undertaken by students individually. This project does not feature direct user interaction. Instead students are tasked with learning how to build and utilize simulation tools to support their design and testing. Where they may be able to more passively listen to user feedback during the universal design project, the assistive design project attempts to build empathy by getting students to put themselves directly into the same scenarios as users to attempt to experience and understand potential problems directly.

For the assistive design project, students are assigned to one of two scenarios. The first scenario is that a user with one leg has to travel from the architecture building (where the studio classrooms are located) via campus shuttle to a bookstore on the edge of campus, purchase an item and then return. The second scenario is a user with one arm

has to go to the cafeteria, purchase several items for a meal and be able to pay and transport everything to a table to eat (Fig. 2).

Fig. 2. Students simulating conditions in the assistive design project related to a missing arm (left) and missing leg (right).

Note that in both cases, the specific product that should be designed is not specified. Instead, the students are tasked with simulating the scenario themselves and through the experience identifying a specific problem that they can solve through design. The specific problem along with design requirements and performance criteria are defined and students measure their final solutions against them.

3 Empathy Exercise

A different approach to building empathy is taken in a class on human factors and ergonomics named Human Factors in Design. It is a one semester course. While it is designed to be very interactive, unlike the project oriented design studio, it is a lecture based course. There are fewer opportunities to learn empathy. The students are not undertaking product design oriented projects so there is not the same aspect of potentially interacting with users, gathering needs or fabricating and testing designs. Yet at the same time a level of empathy is important to the topic. Just as in designing a product, students must learn to think about human operators who have different physical or psychological attributes when evaluating products, controls, displays, safety, and so forth.

In order to get students in this mindset, an exercise is conducted at the beginning of the semester, typically during the fourth class meeting. The exercise involves students rotating between four stations and performing tasks at each one. Each station contains simulations that highlight how perception and feeling can be altered with age or disability. There is a station for:

- Dexterity (Fig. 3): This station features gloves that are designed to restrict joint movement and athletic tape to restrict individual joints as well. Wearing these

students perform actions like sorting pills, writing while using pens of different sizes and lengths and taking compact disks in and out of a case.

- Mobility and Balance (Fig. 4): This station features equipment like wheelchairs, grabber/reacher tools, shoes and bandages for reducing the mobility of large joints. Using these students perform actions like washing their hands in a bathroom while using a wheelchair or making calls with their phone with restricted elbow movement, putting items in a bag using a grabber tool or walking on a line with popcorn kernels inside their shoes.
- Sensitivity (Fig. 5): This station features items such as latex gloves and ear plugs. Using them students perform actions like threading a needle, lacing shoes, sorting pills or turning pages in a book while wearing latex gloves to reduce their sensitivity to touch. They also attempt to do things like have a conversation or make calls on their phones while wearing earplugs to simulate reduced hearing.
- Vision (Fig. 6): This station features items such as eye masks and a Zimmerman Low Vision Simulation Kit. Students perform actions such as threading a needle, reading instructions on a fire extinguisher, finding a passage in a book or reading contacts from their phone while wearing different goggles from the vision simulation kit. The goggles contain lenses that simulate different conditions such as cataracts, macular degeneration, different levels of visual acuity and other conditions.

Fig. 3. Students performing activities at the dexterity station during the empathy exercise in the human factors class.

Fig. 4. Students performing activities at the mobility and balance station during the empathy exercise in the human factors class.

Fig. 5. Students performing activities at the sensitivity station during the empathy exercise in the human factors class.

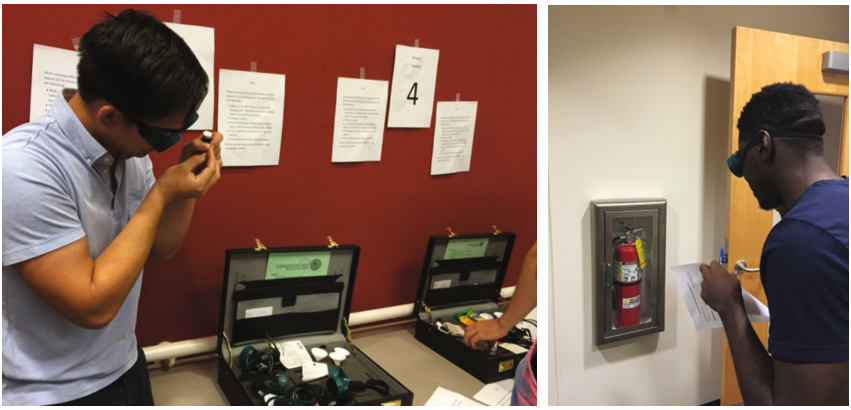

Fig. 6. Students performing activities at the vision station during the empathy exercise in the human factors class.

Students spend 10 min at each station performing various suggested tasks. Students also must answer 5 questions at each station:

- What did you find difficult and why?
- What things were easier or more difficult to do than you expected?
- What do you now think about the experiences of people you know who face problems such as this?
- What might make these experiences easier for people who face these problems?
- If you or your friends have faced similar issues, what systems have you come up with to deal with them?

The exercise with questions at each station are done before topics related to the physical senses are covered in the class. The goal is to get the students thinking about their own past experiences or to give them some new perspectives on how common tasks can be very different for different people. When introducing the exercise, this goal is explained and that it should make them think of ways to build empathy with users with different abilities when they are tasked with evaluating the human factors of a design. Finally, it is also clearly explained that the tools at the stations are only simulations and thus can have important drawbacks. Namely that the tools can help them have different experiences (and see a different perspective) with a task but it does not necessarily mean that those experiences are the same as what is encountered by users. It is still important that whenever simulation is employed that experiences and findings are still verified with actual users, otherwise conclusions based on simulated experiences can be as much or more incorrect as if they were never used at all.

4 Discussion

The setup of the studio vs the human factors class was very different. Since students' goal was to design a product in the studio, this provided many opportunities for interacting with users and others that just were not a part of the other class. For example, studio assignments feature a presentation halfway through the project. In it they provide an overview of their research activities, outline the requirements for their design solution, present potential concepts, and their plans for testing and evaluation. Often a panel of visiting design professionals visit to provide feedback.

During the UD project, the midpoint presentations featured results from user testing with initial prototypes and many students/teams find that many of their design assumptions made in initial concepts do not perform as expected with actual users. For example, most of the mobility-impaired users indicated that they did not want the shopping device to be attached to the manual wheelchair or that such a connection must be easily/rapidly engaged/disengaged. Users' felt such an attachment could limit their mobility and could make maneuvering difficult in some situations. Students generally had assumed that such a connection would be needed since the user's hands would likely be required to propel their manual wheelchair and as such would not be available to move the shopping device. Mobility-impaired users also expressed the concern that anything placed in their lap might unknowingly cause physical injury since many did not have sensory feedback in that area due to their physical limitations. Users with visual impairments preferred designs that allowed them to reduce the need to ask questions/interact with others, designs that allowed one hand to remain free (to allow them to use a cell phone, white cane or service dog) as well as designs that reduced the amount that they would need to carry.

During the assistive design project, students tended to run into other issues. The more open nature of the assignment meant that they had to spend time creating the scenario and then finding problems that they actually experience. In some ways one would expect that this would be fairly straightforward. Students were free to design something that addressed any problem related in some way to the scenario. But this actually generates two tasks that can be somewhat difficult for students experiencing it for the first time. The first issue is that they need to simulate a condition and put themselves into the scenario (which is itself specifically defined). Some students, especially ones assigned to the missing leg scenario, seemed to run into more problems with finding a way to simulate the experience than students assigned to the missing arm scenario. The second issue is that the students have to engage in problem/design opportunity identification. This is a more 'wickedly' difficult problem than most students expected. It was a first time experience for many who are mostly used to getting assignments that specifically lay out the parameters for what they need to design (i.e. design something that does X, Y and Z and performs in specific ways). For many students this was the first time they would have to identify both the problem but also define what a product should do and how it should perform. It is problem identification followed by problem solving (rather than just problem solving), and at least for the first part of the project was a larger concern for students than the accuracy or fidelity of their simulation approach.

The human factors class features one final project. In it they are assigned the task of designing the interior of a micro-car. This includes the design/arrangement of controls and displays as well as the ergonomic design and placement of physical items such as seats. The challenge in the project is fitting all assigned components into a limited space and describing/justifying their design selections for each component. As it does not include full scale modeling/mockups there are few opportunities for user interaction. However, students doing the project have to identify the various target user groups and describe how their design inclusively supports them.

5 Improvements and Conclusion

The issue of resolving how to address conflicting input was a consistent stumbling block for many students. When feedback from several users was different or user opinions conflicted strongly with student expectations, it tended to lead to "analysis paralysis" in determining how to continue for many. Conflicts and tradeoffs are a feature of any real world design and providing ways for students to experience and learn to handle it is an important objective.

However, the relatively short length of studio projects (5–6 weeks as most) can lead students to bias their solutions in unintended ways. Including users with disabilities from the start of the universal design project is important. It is something that works well if it is organized as it provides students with user interaction in a controlled environment and consistent experience. Since many students do not have the personal/professional connections to contact these users it is the only way to be sure that they can actually get in contact. Since this was organized through the class, even though students were tasked with contacting and testing with other (easier to reach general) users, the opinions and feedback from the disabled users tended to have more weight in their decision making.

Studio project length is an issue. Particularly when users are involved, a longer duration project may be more beneficial. This is due to several issues. Fabrication of testable models can take quite a bit of time. The need to produce testable models definitely limited the range of ideas students explored, resulting in the tendency to develop their designs along predictable and "safe" avenues. However, longer projects may not be needed if the object of development is software rather than physical products. It was observed that testable mockups of software interfaces could be explored and created much more quickly than physical prototypes.

Though very challenging to Sophomore level students, the universal design project proved to be an effective means of introducing UD to students early in their design studies. They learned (1) basic principles; (2) how to conduct usability testing (formative and summative); and (3) how to work with users (interviews, gathering data, observation etc.). Typically, students have no problem designing for the needs of themselves and their classmates. Problems generally arise when students must design for other user populations. The ability to interview and perform usability testing with mobility and visually impaired users effectively "put a face" on the wants/needs associated with such impairment and motivated the students' efforts to address their concerns in addition to the needs of those without impairment.

The logistics of recruiting users with disabilities for this type of project presents limitations. Interviews and observation of users is not in context. For example, students could research and ask about the shopping habits of disabled users but students could not leave class with the users to go test in a store environment. Future updates could include organizing opportunities that allow students to interact and test with users within more realistic environments. This way they might gain a better perspective on user needs/wants and build stronger empathy than would be possible only from classroom/lab based experiences.

Acknowledgments. The contents of this paper were developed in part under a grant from the National Institute on Disability, Independent Living, and Rehabilitation Research (NIDILRR grant number 90RE5007-01-00). NIDILRR is a Center within the Administration for Community Living (ACL), Department of Health and Human Services (HHS). The contents of this paper do not necessarily represent the policy of NIDILRR, ACL, HHS, and you should not assume endorsement by the Federal Government.

References

1. Ostroff, E.: Universal design: an evolving paradigm. In: Preiser, W., Smith, H.K. (eds.) Universal Design Handbook, pp. 3–11. McGraw-Hill, New York (2011)
2. CUD: The Principles of Universal Design. The Center for Universal Design, North Carolina State University (1997). www.design.ncsu.edu/cud/about_ud/about_ud
3. Fletcher, V., Bonome-Sims, G., Knecht, B., Ostroff, E., Otitigbe, J., Parente, M., Safdie, J.: The challenge of inclusive design in the US context. Appl. Ergon. **46**, 267–273 (2015)
4. Burgstahler, S.: Universal Design: Process, Principles, and Applications. DO-IT: University of Washington (2007)

Design for All. The Increasing Dissemination of Teaching Experiences

Giuseppe Di Bucchianico(✉)

University of Chieti-Pescara, Viale Pindaro, 42, 65127 Pescara, Italy
pepetto@unich.it

Abstract. At the same time with the latest global demographic phenomena, have developed and quickly spread different design approaches related to the more general definition of "Design for inclusion". Among them, the Design for All seems the most appropriate to spread social awareness oriented to the inclusion, in addition to being particularly effective for the training of young designers, because it forces them to consider the constraints and opportunities arising from the complex system of target project. The text describes some educational experiences conducted in recent years in Italy, in the University of Chieti-Pescara, referring to a number of application areas: bathing, shopping, sign systems, preparation and consumption of food and drink, gardening. The text highlights the importance of the training time to increase awareness of young designers on the issues of human diversity and social inclusion, and at the same time the way in which the DfA approach would encourage innovation, particularly through effective design concept.

Keywords: Sociodemographic phenomena · Design for inclusion · Design for All · Teaching experiences

1 The Different Design for Inclusion Approaches to Tackle the Global Socio-demographic Phenomena

The contemporary global scene is facing some socio-demographic phenomena of epochal dimensions.

The main demographic challenge, especially for industrialized economies, is an aging population. The world population of 9 billion in 2050, will consist of approximately 2 billion from "over 65". So, what once was the old age is no longer a residual period: the lengthening and improving the quality of life, has extended this stage of life to a period that covers three decades. More and more it often happens that over sixty people are active both towards their grandchildren both towards their elderly parents, maybe ninety, and they simultaneously operate in the social field.

But inevitably, if the progressive aging of the population increases the pathologies, even partially invalidating (chronic degenerative diseases and mental illnesses, reduced sensory capacities, reduced mobility, etc.), maintaining an adequate quality of life can

G. Di Bucchianico and P.F. Kercher (eds.), *Advances in Design for Inclusion*,
Advances in Intelligent Systems and Computing 587, DOI 10.1007/978-3-319-60597-5_2

be guaranteed by all the elements that promote active aging, or the accessibility to services, the ability to maintain social relationships, or the ability to move, to travel and to act independently, benefiting from a stimulating and accessible environment.

Likewise, thanks to medical advances and a growing social and cultural awareness to issues of disability, including a growing number of people with disabilities has been recovered in the active life. Indeed, if at the beginning of the twentieth century the disability was regarded as a matter which concerned a small minority of the world population and the majority of people with chronic diseases were confined to living in institutional care[1], today the situation is completely changed: only in Italy the disabled are about 3 million, representing approximately 5% of the population, and of these only about 7% is recovered in care institutions[2].

Simultaneously with these socio-demographic phenomena, contemporary society is increasingly characterized by "social liquidity" [1], which probably will be expressed increasingly in the form of multiculturalism, multi-ethnicity, multiageing, multidimensionality, multitasking.

And if the European Union has built its motto "United in diversity" precisely from these phenomena, already for several decades new approaches to the design of environments, products, services and systems have been developed, attempting to intercept the new requirements expressed by this human diversity and promoting inclusion.

It can now be argued that the main approaches of the "design for inclusion" are basically three, each with its own specific characteristics: Universal Design, Inclusive Design and Design for All.

1.1 Universal Design: An Expression of the Anglo-Saxon Pragmatism

The Universal Design (UD) for over thirty years expresses a fundamental objective of good theory and design practice: meeting the needs of as many users as possible. Not a set of size requirements, comply with codes, standards, or to special characteristics of specific users with disabilities, but the reference to general principles of simple design implementation and verification. The Universal Design in fact for the first time not only focuses on people with disabilities, but defines the user extensively, suggesting to make all products and spaces accessible and usable for persons to the greatest extent possible. Not everything has to be fully usable by all: the term "universal" refers more to a methodological attitude than assumed as rigid and absolute.

Born and grown up from the United States, The Universal Design bases its approach on a didactic reduction to seven design principles, simple to apply and thus of rapid spread around the world. This, however, tends to an extreme schematic designation, and above all not taking into account the individual's complexity and the diversity and variability of the human race, changing by age, physical and mental conditions, cultures, attitudes, desires and aspirations.

---

[1] In Italy, for example (but the data can be extended with small variations to all Western countries), the life expectancy of people with disabilities at the beginning of the twentieth century was just over 50 years, and the chances of surviving a lesion of the spinal cord were of about 10%.

[2] Source ISTAT, referring to the Italian population.

1.2 Inclusive Design: Design with Attention to Diversity

Unlike Universal Design, the Inclusive Design (ID), which has its main development center in the UK and countries of British influence, does not put dogmatic design principles, but defines a real careful approach to human diversity and it is based on the idea that no policy, standard or guideline can be absolute but must always deal with the multiplicity of users, contexts and objectives. The Inclusive Design, in fact, considering the wide range of skills, languages, cultures, genders, ages, and all other possible forms of difference between users, bases its approach on three "dimensions": recognizing diversity and uniqueness among individuals, the inclusiveness of the tools and design methodologies, the amplitude of the repercussions in terms of benefits.

1.3 Design for All: Participation and Process

Design for All (DfA) aims to improve the quality of life of individuals by enhancing the specificities and diversities: a holistic approach to processes and methods of project environments, equipment and services, accessible "in an autonomous manner" by people with different needs and abilities. It does this mainly through the process of project development, which is itself inclusive, participatory and at the same time effective tool for education and dissemination of the same principles of DfA, which is succinctly known as the "design for human diversity, social inclusion and equality"[3].

2 The Strategic and Training Value of DfAapproach

Among the different design approaches for inclusion, DfA appears therefore to be more appropriate for the dissemination of a social conscience oriented to the inclusion.

DfA, in fact, does not propose a new type of design nor it is a new project discipline; it is rather an approach that enhances the concepts of participation, sharing and inclusion; is a new sensitivity on the issue of human diversity, not as discriminating factor but as a systemic feature of the human race, both physical and cognitive, social and cultural; it is therefore, first and foremost, a growing attitude on civil and cultural level, which has inevitable repercussions on and across all areas of the project, to envision spaces, products, services and systems that are pleasantly usable independently from the widest possible range of users, regardless of age, gender, ability, culture or group.

The participatory dimension of the DfA design process, involving all stakeholders in the various stages of development, then, is the strength of this approach. This assumes both a strategic value for companies and a formative value to the training centers, at all levels, and especially universities.

For companies, sharing DfA approach means first to become aware that there is a market for a standard user and therefore not partially different from that which has so far turned industrial design: a DfA project widens the SME market as it meets a greater customer base/target, it builds loyalty, it allows the same company to gain visibility and

[3] EIDD, Stockholm declaration, 2004.

therefore to strengthen its brand identity to the themes of innovation and social sensibility [2]. In summary, a DfA project takes on a strategic value, primarily for those who propose and develop it, whether it is a company or an organization, public or private. On the educational plan, DfA also seems particularly effective for the training of young designers, because it forces them to consider both the complex system of constraints and opportunities arising from the project target, extended to the widest range of "all" the possible users of environments, services and products, as well as push them to get out of their own narrow sphere of activity of future designers to interact with all the players in the project value chain. The inclusive project, in fact, presupposes an inclusive culture and therefore an education system that values human diversity at all educational levels, for generations to come.

In this some Italian universities, especially in the project disciplines, and in particular in industrial design, for several years has enabled different teaching levels on Design for All, or at least related to the broader theme of inclusion.

3 Some DfA Teaching Experience

In recent years in Italy, and particularly in the Department of Architecture of the University of Chieti-Pescara, they were carried out, at several levels, different teaching experiences related to project and participatory DfAapproach. Starting from individual courses, up to the Master degree laboratories, project issues were addressed related to many fields of application such as bathing, shopping, signage systems, preparation and consumption of food and drink, activities conducted in the home such as gardening, and other activities and areas with respect to which the reference to a participatory and inclusive approach to design allows you to give an answer, directly or indirectly, to social issues related to human diversity.

3.1 Bathing: Tourism for All_Design Lab "Balne*abile*"

For some years there is an ongoing intense debate internationally on the topics of tourism, leisure and hospitality time referring to inclusive products and services, and on the undoubted economic benefits, direct and induced, that a "Tourism for All" can lead in the next future. The seaside businesses of the city of Pescara, however, are the bearers of a story, an experience and a multitude of services that represent a single territorial heritage, especially related to other resources (historical-artistic, culinary, natural and cultural) in the most extensive coastal territory.

On this basis, within a specific design laboratory, which involved directly also to industry traders, several projects related to inclusive use of the bathing facilities were developed (Fig. 1), by the size of individual products and equipment to the entire bathhouse, assuming in many cases even specific useful services to assist users with different needs and abilities.

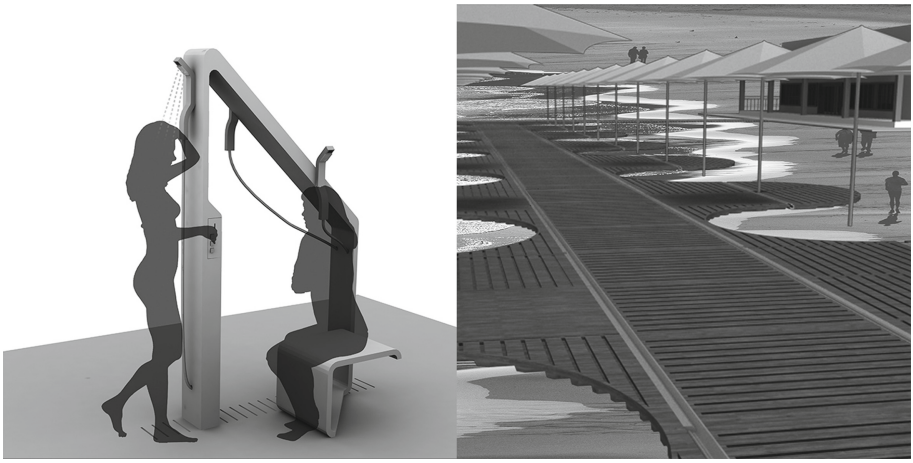

Fig. 1. Some design concepts from the "Balne*abile*" design lab.

3.2 Shopping: Shopping for All_Design Lab "the Natural Shopping Center"

In many cities the central areas often tend to lose attractive value compared to its traditional role as a "shopping center": too many are indeed alternatives or simple "artificial"external forces, that separate the traditional stakeholders of commerce from the urban centers (both referred to supply and demand). In such cases, to recover positions with respect to competing alternatives, the city center should be able to characterize the image of the city in which it is inserted, enhancing the uniqueness but at the same time proposing new experientialities, to intercept, through its places and its local identity, new fruition demands.

On this basis, through the DfA approach, within the framework of the didactic activities of an industrial design teaching, they have been re-thought and imagined in a new way the main "shopping streets" of the urban center of an Italian city: they were transformed into Place Brands to individually help enhance the entire city, and at the same time make the shopping experience something new, meaningful, exciting and truly inclusive, for example by integrating the communication project with the project of street furniture. This is to respond in a full and consistent way not only to the needs but also to the desires of all the people who for various reasons are related with the city through its streets.

3.3 Shopping: Shopping Experience for All_Master Degree Thesis

The opportunity to perform independently and comfortably all daily activities, including those related to amusement and recreation such as shopping, is a basic precondition for pursuing the inclusion. In this it is particular important to put attention to the needs of so-called "limit users", i.e. that particular group of individuals that presents the specificity considered as more "critical" for playing an activity, and therefore an experience, in an autonomous way.