DESIGNING THE DIFFERENCE IN AN INCLUSIVE WAY

Rita Assoreira ALMENDRA
Faculty of Architecture, Technical University of Lisbon, Portugal

ABSTRACT
This paper proposes inclusive product designing as a way of creating a more collaborative material culture and of engaging in a meaningful social dialogue among people. Illustrating the argument it will be briefly presented the result of two research studies (two supervised master students) aiming at critically solving design problems of specific groups of populations and regarding two different fields of action: sports - visually and hearing impaired individuals in the swimming field (that resulted in a toolkit of objects named WeSWIM) and medical area - an insulin taking diabetic all-in-one equipment. The proposed approaches strongly defend inclusivity since they, in distinct ways, act as social integrators given that the drivers of both designs are the access of users to autonomy in use, the leverage of self-esteem and the reduction of constraint while using the object in a social environment. One of the central issues to design research, education and practice at the XXI century is the change in demographics that clearly calls for an inclusive approach to the design thinking and acting. Being so, the research on how design can contribute to solve most of the problems arising from the diminishing physical and cognitive abilities should integrate the agenda of design research, education and practice as a priority topic. Both the studies being addressed in methodological terms favoured the qualitative methods that clearly capture best the user's experience – literature review, case-studies, survey, design project and experiments with sample and control groups. The results were two products/systems improving user's performance and use both at the physical and cognitive ergonomic levels. With these two systems individuals with special needs can be better integrated in day life activities and in the case of the system created for swimmers those so called 'normal individuals' also benefit directly of the inclusive approach to design since they might use the system for training purposes.

Keywords: Inclusive design, inclusive teaching-learning process, inclusive research

1 INTRODUCTION

One should return to the essence of design, the reason of its existence: human problem solving.
Western societies are experiencing critical moments not only due to the economical crisis but also due to a crisis of values. In addition, the cognitive load arising from this complex world asks for a reflection of all the knowledge areas aiming at simplifying and making more friendly and meaningful human life and its experiencing. Margolin [1] acknowledged the existing competition between what he called the 'politics of principles' i.e. the compromise with everybody rights, and the 'politics of power' based on the individual, collective or national quests and achievements of personal interests. This competition creates a gap between intentions (expressed by means of right declarations) and practices (implementation of actions corresponding to those intentions). In addition, as observed by Tackara [2] the eager will of success and development in the technological areas created a problem of innovation's agenda that must be solved putting again people before technology and focusing more in systems and services over objects or gadgets.

2 EDUCATING THE INCLUSIVE DESIGNER

Design Education faces huge challenges in this XXI century. As Press and Cooper [3] referred this is a century dominated by two central issues: the demographic change and the sustainability emergence. In this macro context the European design education system along the last 20 years has evolved its curricula, not only in order to integrate and develop the technological component, but also to accommodate contents related with sustainability and inclusivity that can be critically seen as the humanistic way of dealing with the extreme complexity of our global societies that is insufficiently

served by technological means alone. Human problem solving now more than ever cannot be seen and dealt independent of its context, meaning that a whole system must be assessed, understood and served. This implies a holistic approach to problem solving i.e. designers should assess a big picture of the problem thus exploring different points of view on the subject. Consequently the understanding and teaching of design as a collaborative discipline, one that interacts and facilitates knowledge arising from other scientific areas, is an imperative. Moreover, the learning environment must involve users and their perceptions and needs. It is here where we come to the inclusive design teaching –learning process and its crucial role nowadays.

2.1 Inclusive design approach

As proposed by Hansen [4] inclusive design is the creation of products and environments used by all without the need of adaptation or specialized design (see Table 1).

Table 1. From special needs to inclusive design (adapted from Hansen, 2006)

SPECIAL NEEDS	INCLUSIVE DESIGN
Designer client. Persona of a young, fit, active, male, white adult the yardstick for good design.	People are individuals who have different needs and requirements during their life course.
Others – older people and people with disabilities – are not 'normal' clients.	Us – we all have goals/aspirations as well as problems/impairments.
They have 'special needs'.	We have 'generic needs'.
Micro-environmental approach	Macro-environmental approach
Ethos of specialization and pragmatism.	Ethos of normalization and enablement.
Tailors the environment so that it is 'just right' for each client group.	Extends parameters of design until no one is excluded.
Telling people what they need.	Asking people what they want.

A product should be designed to function in different contexts but more than that to make them part of the inclusive system it integrates. That brings us to Hansen [4] definition of inclusive environment, one in which each user, independently of his/her abilities can live everyday life comfortably, with efficiency and security, without being limited by a bad design. Nevertheless, it is proved that in many cases it is impossible to offer a "one size fits all" solution, so, some individuals will always be excluded [4]. Bearing that in mind it should always be part of a good design thinking process the goal of creating a product and/or service that fits the needs of the large majority. An inclusive design approach that understands a product as part of a wider system of products and services comprehends the mental switch in design thinking that Atkin [5] synthesizes in Figure 1.

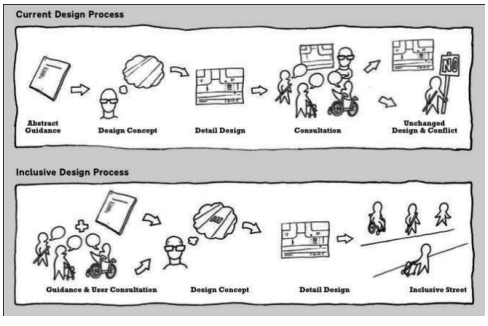

Figure 1. Representation of inclusive design thinking (Atkin,2010)

This mental switch must be formalized in a methodology that provides guidance to designers while developing their inclusive design solutions In the case of an inclusive design approach one can either have an user-centred or a participatory methodology since both focus in users in the structuring of the design/research process. In this paper we will focus on the first one.

2.2 Inclusive design as a user-centred methodology

As Krippendorf [6] observed artefacts do not exist outside human environment and their recognition, understanding and construction occurs with persons that develop a meaning system after it. The user-

centred design methodology as defined by many authors and synthesized by Upa [7] takes into account user's information early in the process and the main driver of the process is the user, his/her needs and desires. There is not an international pattern unifying user-centred design methodologies however the norm ISO 13407 defines a general process including user-centred activities along the development process giving space to the use of different methods. Among those activities one can find: a) the specification of the context of use – identifying the individuals that will use the products and services and the conditions of the experiences with it; b) the specification of requirements – both business and user's ones; c) the production of design solutions and last d) the evaluation of designs being this part essential to the process and normally accomplished through the use of usability tests done with real users.

2.3 Inclusive design teaching-learning process

Teaching how to research and design in the area of inclusive design is a complex task since it comprehends firstly the apprehension of several framing key concepts and models (that involve several scientific areas and specialized knowledge) and secondly the development of an inclusive product/service which demands a user centred approach, meaning an intense contact with users and with specialist from distinct fields. The broadness of the approach, claiming for a special care with details not losing the 'big picture' while progressing in the design of a solution, makes the teaching-learning process a very rich and intensive one. It calls for a closer supervision of the research process, a thorough preparation of all tasks and some training regarding the field work especially the one related with user's interaction and relationship. It is than important to identify what are the major issues arising on the part of students concerning an inclusive approach to design. As Dong [8] acknowledged students are usually more inclined to think of physical aspects rather than in sensory and cognitive ones. Moreover, she refers that students engage better with actual situations over hypothetical ones. The interdisciplinary collaboration tends to be feared by students since they perceive it as a complex and risky task. To overcome this obstacle it is required careful planning and coordination and the creation of collaborative shared moments between students and other professionals. It is also advisable the use of case studies to illustrate the inclusive design process. However, the most challenging action is the one of putting the projects into actual situations. This is the moment to contact with users including those with limitations thus arising specific potential problems including: a) the possibility of users being unable to communicate their thoughts, b) of not being the purchaser of the final product, c) of having very specialized and little known requirements, of the existence of conflicting requirements for the product provided by different user groups. This contact that is in itself a rather rich learning experience tends to be best succeeded with the mediation of individuals that deal with those user's differences in a daily basis.

3 TWO INCLUSIVE DESIGNS THAT MAKE THE DIFFERENCE

Designing the difference means recognizing it, respecting it and assuming it as the main value of any possible solution arising from the design process. According to Herwing [9] acquired abilities made along human development are kept and keep growing until the adult age. From 50 years on there are three abilities that start to be lost namely the visual, the motion and the cognitive ones.
The two designs to be presented here are the result of two master thesis researches exploiting inclusive design methodology as a way of improving individual's lives.

3.1 WeSWIM swimming system

The weSWIM kit is a set of devices aiming to help swimmers to improve their performance both in training and competition. The devices might be used individually or grouped according to the needs of the users. The kit integrates: a package (that is simultaneously a light system); a bracelet; headphones; an information panel; a solar panel and an electromagnetic charger.

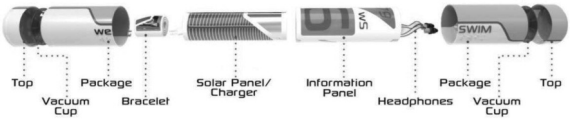

Figure 2. The weSWIM Kit system (source: Bernardo Moreira, 2012)

Figure 3. The weSWIM system (source: Bernardo Moreira, 2012)

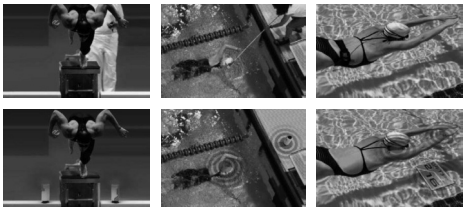

Figure 4. Deaf and blind swimmers use of WeSWIM system (source: Bernardo Moreira, 2012)

The development of the concept benefited from the fact that the researcher is a professional swimmer that has a deep knowledge of the sport as well as of the needs of both normal and handicapped swimmers. The improvement of performance was the main goal to be achieved through the improvement on autonomy, self motivation and self esteem since these are key issues according to literature, the trainers and experts in this sports area.

3.1.1 Methodology and methods

The starting point of this project was the literature review made in parallel with case studies of several existing systems (that work separately) aiming to solve the problems tackled by this system namely: departure system, information panel, turns inside the swimming pool, control of time, laps, velocity etcetera. This information served as the framework of a second phase of research that included exploratory interviews with users and coaches; the creation of a prototype (with several consultancies both with clinical, technical personnel and with technology engineers); a pilot test of the system (with 15 swimmers of both sex with ages between 16 and 25); adjustments on the solution after the feedback of the pilot-test subjects; the test both with normal (20 athletes) and handicapped athletes (6 physically handicapped; 6 deaf and 3 blind) with ages between 10 and 41, was made in the several swimming pools used by swimmers in their daily training - The sequence of tests (done during a period of 1 month) was divided in 5 groups correspondent to each of the existing devices and followed the order: group1- kit – testing the packaging- opening/closing, reading information (also Braille one); group 2 – departure system – test with and without swimming glasses; choice of possible colours; departure with alternate lights; departure with synchronized lights; low departure; high departure; group 3 – bracelet – reading of info with and without glasses; departure from top and bottom; 50 meters (all styles) with turning; group 4 – Information panel – visualization of each of the 3 panels in all styles 200m/400m; group 5 – sound information system – hearing music; voice instructions; beep system of approach to the wall to turn. All tests were videotaped and photographed to be later analysed in depth. Finally, a survey with users and interviews with coaches, family and other stakeholders involved allowed us to have feedback about the whole process especially the part of the system usage.

3.1.2 Results

The methodological triangulation allowed reaching several conclusions not only about the methodology itself but also about the kit. The comparison made on the existing devices and systems made clear the potential of the WeSWIM kit since unlike those, this is an integrated solution thus allowing to have more in less space, in a coordinated way and with unique features (underwater information panel; radiofrequency beeping system through headphones). Besides this the analysis of information arising from tests, surveys and interviews confirmed that the overall evaluation of the system (and its subsystems) is dominated by the perception on the part of all intervenient of the immense value this solution brings to those with disabilities bringing them the possibility of having better performances in a dignified, humanized mode. In addition the performance measurements allowed confirming improvements in the results of the participants – 65% of normal athletes; 50% of physical handicapped ones and 100% of deaf and blind improved their performance. Just to exemplify other results: 60% of normal , 67% of physical handicapped and all the blind swimmers declared they would buy the device; the light departure device reached 71,4% of completely satisfied score being the very satisfied score of 28,6%;. The bracelet information device was seen by 75% of the normal athletes as a major advantage and by all the handicapped ones has of extreme importance; finally we mention some of the results related with headphones that in the view of 55% of normal athletes, 83% of physical handicapped ones and all the blind athletes contributed for leveraging levels of confidence and security; also related with the headphones is the feature that warns the athletes they are reaching

the wall and need to turn - 93% of all athletes considered it of extreme importance since many times their vision gets blurred by the water that enters in the glasses.

3.2 All-in-one insulin taker system

The use of design is increasing in the development of medical equipment, contributing to the improvement of interfaces, equipment, spaces with the aim of resulting in a higher quality of life of patients. This second master thesis research was devoted to the administration of insulin to patients of type I (dependent on insulin on a daily basis). The problem is complex since there are patients that monitor glycaemia levels twice a day and others six times a day. Factors such as weight, type of food, profession and its demands, physical exercise etcetera influence the diabetic control and most of all the type of equipment to be used. The system integrates not only the device to provide insulin to patients but it also includes a mechanism to monitor the levels of glucose and a register of the historic of patient. Normally these functions are not integrated in a single product. This all-in-one product tries to simplify the daily life of a diabetic patient by giving him/her a single product to carry but also very important the product was conceived to be aesthetical pleasant to the eyes and touch making it easier to use in social contexts.

3.2.1 Methodology and methods

The research started with a literature review and the collection and analysis of case studies or equipment that have somehow tried to move in this direction, including, "two in one" devices. This contextual phase was followed by an active research project including the development of a product until the prototype stage to be tested with a sample group and a control group. Sample group – 30 patients (16 females and 14 males); control group – 30 patients (14 females, 16 males); the ages of the participants ranged from 18 to 35 years old and all suffered from Type I diabetes. In the end a stage of validation of results was assured by a panel of experts. The panel, in a total of 7 (4 females and 3 males) included doctors and nurses specialized in this medical area. Moreover, the whole process was developed with the collaboration of APDP – the Portuguese protective association of diabetics. A team of doctor, nurses, patients and family members was implicated in the development process since the beginning.

3.2.2 Results

As a major result of this inclusive research process we had a prototype with the dimensions of 140mmX 60mmX16 mm (see Figure 5) that integrates all the functions needed to a diabetic patient. The systems incorporates an USB plug to transfer data and charge the battery; a memory microSD card; a battery, an electronic interface to allow the measurement of glycemia levels, a needle system; a touch screen monitor; a dosing mechanism; Part of these components already exist in the market. It was also developed the packaging system, the transport bourse, and the instructions of the equipment. This last element is a determinant one since it is crucial to the process of a correct and safe administration and register of the insulin (see Figure 6). The instructions were also evaluated by the patients being one of the elements that was perceived as being of most value. This prototype was evaluated by two groups of users -one that received instructions (GI) and other that didn't receive it (GN).

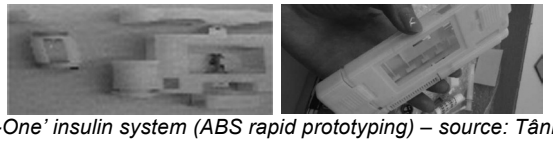

Figure 5. 'All-in-One' insulin system (ABS rapid prototyping) – source: Tânia Frajuca, 2012

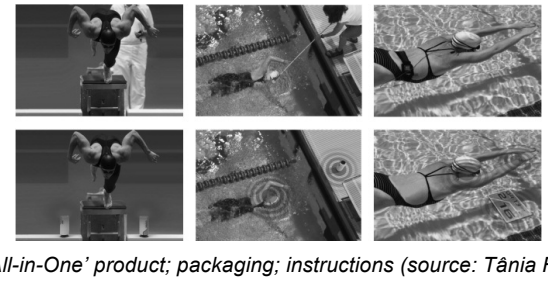

Figure 6. 'All-in-One' product; packaging; instructions (source: Tânia Frajuca, 2012)

Moreover it was evaluated by a group of specialists (GS). Just to exemplify some of the survey results after the experiment of the three groups we acknowledge that GS score the **easiness of use** with 4,3 (in a scale from 1 to 5 in which 5 is the highest punctuation) being the values for the GI of 4,4 and the one of GN of 4,6. In terms of the **overall evaluation** of the device GS scored it with 4.3, GI with 4,5 and GN with 4,4. In terms of the evaluation users make of the improvement this device brings in terms of **diminishing behaviour constraints**, the GS group scored it with 4,and both the GI and GN with 4,7.

4 CONCLUSIONS

As a major conclusion one can point out that through an inclusive approach to solving problems the resulting products work as social integrators, not only among the users but also during the design process among designers, users and other stakeholders involved in the process. Moreover, in areas such sports that integrate what might be considered to be social activities, the inclusive approach clearly facilitates not only the use of the product but also the personal interaction and social integration. That is strongly related with a chain of consequences resulting from an inclusive use that empowers the user with autonomy leveraging that way his/her self-esteem therefore creating better condition to social engagement and integration. Another important result is the recognition that besides the improvement of user's performance at physical ergonomic level, the gains at the cognitive ergonomic levels are to be considered especially by those with any kind of disability that through these products have the chance of perceiving their limitations as being less exposed, therefore, of feeling more at easy in social contexts. Regarding the inclusive methodology it become clear that although highly time consuming and very complex to establish, due to the dependence it has on users and other stakeholders, it is a rich and powerful process clearly adequate to capture more than the use of the products the experience one has with it and through it with other persons. Being heavily dependent on a rigorous planning and coordination as well as on a broaden study of different scientific topics it results best in a context of a medium term research and with a team that includes experienced researchers. Furthermore it is important to state that the adoption of this intensive and highly time consuming methodology implies a rather flexible structuring of the educational systems that must work as an open system that accommodates people and knowledge coming from different knowledge areas and from society.

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REFERENCES

[1] Margolin, V. A call for Social design. *In Best-Practice Medical Design for 2020,* 2007 (Technion, Haifa, Israel).

[2] Press, M. Cooper, R. The Design Experience: The Role of Design and Designers in the 21st Century, 2003, (Ashgate Publishing, Ltd, London).

[3] Thackara, J. *In the bubble: designing in a complex world,* 2005, (MIT Press).

[4] Hansen, J. *The Inclusive City: delivering a more accessible urban environment through inclusive design*, 2006, (University College, London).

[5] Atkin, R. *Sight Line; Designing Better Streets for People with Low Vision*, 2010, (Jeremy Myerson, London).

[6] Krippendorf, K. *Design centrado no usuário: uma necessidade cultural*, 2000, (Estudos em design, Rio de Janeiro).

[7] Upa, *Resources: About Usability*, 2011 (accessed 12 January 2013), http://www.usabilityprofessionals.org/usability_resources/about_usability/what_is_ucd.html>.

[8] Dong, H. Strategies for teaching inclusive design, *Journal of Engineering Design*, 2010, 21 (2-3), 237-251.

[9] Herwig, O. Universal Design – Solutions for a barrier-free living, 2008, (Birkhäuser, Basel).