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Inclusive Housing (Lab) for All: a home for research, demonstration and information on Universal Design (UD)

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Abstract.

This paper states the underlying concept and motivation of the design and building process of a Universal Design (UD) living lab that opened in 2013. The UD-lab is located in the city centre of Hasselt, Belgium and initiates three main ambitions: demonstration, conducting research and offering information on the added values of Universal Design*ing*. The paper confirms the importance of global real life initiatives in order to drive forward the general awareness on Universal Design*ing*, as ongoing activity. Besides the paper stresses the fact that the impact of small local initiatives may instantly bridge the gap between government, institutions and the population at large by means of a UD-attitude.

Keywords. Universal Design, Rehabilitation, Demonstration, Inclusive Housing, attitude, dwelling, Research by Design

Introduction

At the start of the millennium there is a growing awareness for social aspects in the built environment. For long a structural lack of professional knowledge and concern in the socio-spatial context of real world environments with real people was a fact [1]. Last century some important changes contributed to a social shift that created opportunities for inclusive design. First the growing insights in social design and second the demographic changes have had impact on an exponentially growing social awareness of designing the built environment. For example, the postmodern approach in design theories and methodologies made designers more attentive to the lack of human centred design [2, 3]. Universal Design was raised in the eighties from a social model with focus on designing for a diversity of people. More and more social awareness and insight in inclusive design moves towards a cultural model approach [4,5]. Today Universal Design is considered as a design attitude hat may improve the

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design output at all levels and for a diversity of users [3]. Universal Design (UD), Inclusive Design (ID) or Design for All (DfA) are synonyms to define design approaches and attitudes for designers, constructors and users [3]. It aims at creating inclusive physical environments supporting people to live more independently and with less stigmas, by means of attractive and elegant environmental design solutions. The millenium society is ready for this inclusive approach.

Besides the realm of design methodology and design theory in general and the insights in social design, the accelerated attention for the importance of an inclusive attitude in the design process is supported by the huge change in demographic society. The fibroid-like graphics visualize statistics showing young generations are too few to fullfil the supportive needs and care for elderly [6]. Vice versa there is a lack of care givers for younger generations as well. The current change puts urgent questions and ambitions forward regarding sustainable home care at all levels. For example how can we support people to live independent at home as long as possible? Indeed the ageing of the population urges politicians to understand that social relevance and design is as important as ecologic or economic sustainability [7].

To support people living more independently throughout the whole lifecycle it is necessary to create inclusive environments for all. However, in practice it is often remarked that designers, clients, users, policy makers and constructors lack practical and applicable knowledge on creating inclusive environments. Accessibility regulations and norms are available and quiet regularly applied but in practice the information is often too theoretical or the actual solutions are stigmatizing and not elegant [7]. An inclusive attitude on the other hand requires constant feedback of user/experts [8]. This approach is often not implemented into the design process. Moreover, if not required small initiatives mostly do not find technical and design support or advice. For example, renovating a bathroom does not require a building permit or architectural advice from a legal point of view.

For these reasons and to raise the general awareness, local, governmental, provincial and academic organisations[2] decided in 2008 to built an inclusive living lab. EFRO approved funding hence the project could start in real time. We have been working on the building and design processes for more than four years. This paper outlines the main ambitions of the inclusive living lab and the actual UD- results by means of *"Research by Universal Designing"*. First the paper zooms in on the general ambitions and Research set-up of the design, building and perceptual process in the context of UD. The second part of this paper explains the actual results in Universal Design*ing*. The final part explores future ambitions of the lab and the impact of the lab on a global and local scale.

1. General Ambitions and Levels for Research Set-Up

The main goal of the project was the actual design and opening of an inclusive living lab. Whereas theoretical research is necessary for innovation in the domain of UD, the actual building of a project shows the impact on a global as well as a local scale. The building process itself was part of the general ambition to work bottom up and to link design with research, education, and knowledge transfer in order to support

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designers, constructors, users and clients in creating more inclusive designed housing environments. By means of a real built house, the living lab has to reach a diversity of people in society. This bottom up approach in which the needs of people in the real world are attended, can push researchers, constructors, policy makers, firms and designers towards new innovative solutions.

The design itself had to be inclusive and the lab had to demonstrate and generate a UD-ing attitude. Consequently the lab originates out of thoughtful considerations with "Research by Design" as methodologyor in this context "Research by UD-ing".

1.1. Research by UD-ing

The term "Research by Design" and "Universal Designing" have each their separate meaning. Research by Design (RbD) has already received many interpretations in the design world. In the context of the Universal Design lab we used design as a way of investigating and knowledge generating on innovative UD-solutions. In line with the definition of Birger Sevaldson we consider RbD as: "*a special research mode where the explorative, generative and innovative aspects of design are engaged and aligned in a systematic research inquiry* [9]. The difference with other definitions lies in the fact that the "*definition distinguishes design practices in research from other practices. It implies that the design practices by themselves have an inherent element of investigation, innovation and knowledge generation (...) but it also indicates that these practices need to be complemented with a special dimension of reflection to qualify as research."* [9]. "Universal Design*ing*" is defined by Ed Steinfeld and Beth Tauke as a non-stop design and building process with constant feedback of its users [10]. Because feedback of user/experts is crucial to the process of Universal Design, this process never stops.
When RbD and UD-ing meet, an inclusive *"Research by UD-ing-attitude"* is generated and different questions at different levels are raised throughout the whole UD-process: the actual design process, the building process and the perceptual process.

1.1.1. The Design Process

The design process is defined as the actual process of designing the lab. At the start of the project the design of the lab was proposed as a Master design at the Faculty of Architecture and Arts of Hasselt university. Students of 1st Master were challenged to design a lab that would apply the needs as described above with UD-values. Out of 17 student team projects, the best projects served as a succesful source of inspiration and already showed the most difficult challenges.
As soon as funding was secured the project could start for real. Five architect offices were asked to make an offer and write down their ambitions regarding the project. Out of these offices, one was chosen: Victor Simoni. The choice was based on the inclusive ambitions and vision that the office proposed. The architect was initially no expert in inclusive design but engaged himself to broaden his perspective towards a more inclusive attitude. Especially for this project he formally and permanently worked together with an interior architect of Toko architects, who is a wheelchair-user herself. On a regular basis the whole design team could rely on the expertise of user/experts as

well as experts in UD to check the relevance and implications of their design decisions. These experts were chosen by the research group of the Faculty of Architecture and Arts of Hasselt University and the Department of Healthcare of PXL university college respectively. The feedback of user/experts was crucial for all UD-results and elements to assure that there was a non-stop process of UD-ing. By means of "designing" different teams searched for innovative solutions. Several design elements were also designed on the site and at scale 1:1. Researchers, experts, students, designers, constructors and users were all involved. For example the design of a handrail was based on different expertises. As the building was listed as a monument it was not manageable to change all the original details and constructive elements. Only one handrail was present next to the protected staircase. Based on the suggestions and conditions as described by users and experts, models were made in order to find a solution for the prototype of an additional handrail (Figure 1 & 2). For the actual location of the handrail, the architect together with two UD-experts searched for the right location on site. The handrail was placed on a crucial place next to the staircase. This place was limited because of the context of preservation, the laboratory point of view and financial reasons.

Figure1.models of handrail

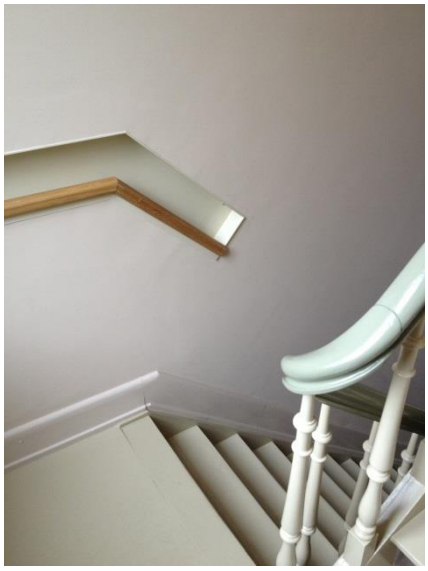

Figure2.built hand rail (right).

1.1.2. The Building Process

Large attention was given to the whole building process itself. In order to guarantee a universally designed result, several actions have been undertaken to support this. Similar to the design process, different expert teams were chosen to follow up the whole building process. For example the coordinator of the UD-lab together with professional experts in UD, constructors and architects were invited to discuss different topics on site or during meetings. Next to the appointed architect, the facility manager and architect of the university college together with colleagues of the Faculty of Architecture were constantly involved in the process as well. The concept of Universal Design was explained to all stakeholders. Nevertheless, it happened that

decisions and designs were made on site and the UD-vision was forgotten. When mistakes were remarked, constructors were asked to solve them. For example the control panel in the shower was placed onto the center of the wall, symmetrical as often conducted. However, in order to use the panel when you are standing outside the shower, the experts had decided to place this panel asymmetrical and close to the open space in the bathroom. The workers on the other hand did not follow the architectural plan. Unfortunately this mistake was noticed when the shower was already fully tiled. Nevertheless, the building team decided to reinstall the whole infrastructure.

1.1.3. The Perceptual Process

The non-stop "Research by UD-ing process" is also guaranteed by means of giving attention to the actual perceptual process of users. The Inclusive Housing Lab for All serves a permanent experiential and experimental environment: a place for stimulating processes of experiential analysis and (re)designing. Academics, students, professionals, user/experts and visitors are immersed in a real socio-spatial environment to test, design and construct real time solutions. This way research and innovation are integrated in permanent co-creation processes. Relevant research relates to new insights in the structure of dis-abling environments and in functional limitations (motoric, sensorial, and mental) of the widest possible diversity of people and circumstances of use. Innovation refers to new morphological/technological design solutions for *en-abling environments* [11].

It offers place to take the actual experiences of users into account during the final design and creation. For example, the bathroom demanded for support bars. As the lab demonstrates UD and avoids the focus on Design for Special Needs, an interior designer was asked to make an elegant art work (Figure 3 & 4) that could serve as a handrail, support bar, a place to hang towels, etc. This design would certainly avoid to create a stigma. The designer was inspired by the concept of a climbing frame. In the first design stage she made a drawing that was placed inside the shower. A first occupancy evaluation took place and different heigths were changed according to the suggestions made by people with visual impairments and wheelchair users. Before the actual design was made, a prototype was again tested by users. Although the actual design is already placed now, the process of testing moves on while several architectural students and students in occupational therapy can test this installation together with user/experts. This way future design can be improved.

Figure 3 & 4. art work support bars in bathroom

At each level the whole team always aimed at the best possible solutions. However, the complexity of the building process challenged different contributors more than once. Communication was the key word in this project and throughout the whole process. The success of the final design results can be measured in relation to the degree of communication that has been taken place. On top of the huge challenges made in order to obtain a Universal Design project, the management team decided to locate the lab in a listed monument in the city centre.

2. An Inclusive Housing Lab in a context of Rehabilitation

One of the first considerations of the management and early design team was the location of the lab. Could it be a new house or would it perhaps be a lab built as a laboratory within the university or should we start renovating an existing house? The preferred choice of the project and location was a house listed as a monument and protected by the Monuments office. It is a typical historical row house dated 1913 and used to be a porter's lodge of an old maternity hospital (Figure 5).

Figure 5. Facade renovated porter's lodge

This early twentieth century dwelling offered a huge amount of challenges at several levels. A renovation project is fundamentally different from a contemporary building with respect to the actual concept, building materials and construction techniques. The decisive reason for a renovation project was that this house typology would be very recognisable for many people living in a similar house in Belgium.
The program of the UD-lab emulates three main ambitions: demonstrating, offering information and conducting research in Universal Design. The lab consists out of an

entrance hall linked with a visitor and information centre and two housing units. The total surface area of the lab is 485 m^2 (demonstration house 264 m^2, visitor center 156 m^2 and open space laboratory 65 m^2) (Figure 6). At the heart of the living lab is the demonstration house that shows the latest innovative solutions in design like different inclusive systems to open doors, an adjustable kitchen, high tech domotics to assist your wishes in the environment, …During the UD-process choices were made based on feedback of user/experts showing different options.

Figure 6. Ground floor (left), 2nd floor (middle) and 3rd floor (right) plan of the housing units

The UD Living Lab intends to show that the need for personal assistance can be reduced to a minimum. Adaptable living and comfort can be supported when a Universal Design attitude is achieved throughout the design process. Consequently the design results support people in an elegant way. For example the inside ground floor is situated 34 cm above floor level in front of the main entrance. To overcome this barrier people are used to take two steps. But from an inclusive point of view this offers no solution as several people are not able to enter. The Monuments office had an additional requirement asking to keep the original floor tiles or to search for identical copies. As soon as this condition was fulfilled the original steps (17cm) were removed and replaced by an integrated platform lift in the floor of the entrance hall. However, for the protected view, the possibility to use steps is kept. In addition the user can make use of a switch, badge, and remote control from tablet or smart phone to open the front door automatically. Simultaneously the lift is placed at the right floor level and leads you to the entrance (Figure 7).

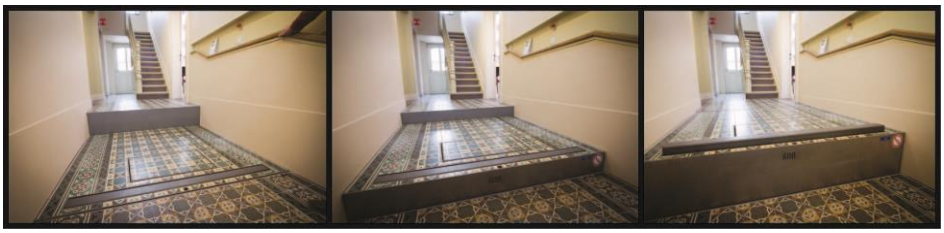

Figure 7. Lift platform in entrance hall

All corridors and doors allow circulation with buggy's, wheelchairs, rollators/walkers and people giving support or assistance to a user. Rotating doors facilitate the use for everyone. Doors can be slid in order to create more space or guarantee privacy. The bathroom, adjacent to the toilet, can be enlarged with an interesting system of sliding doors. By means of home automation, each place can be adjusted from a pleasant working environment to a relaxing place to rest with different lighting techniques and automation. For example a 'Smart Television' in the living room provides, apart from entertainment, a series of services for people. Besides the fact that these techniques are very usefull for all of us, people with reduced mobility and/or sensorial functional limitations (voice and image recognition, remote control front door) can delegate several actions without the need to move. For people who are tired or with reduced stamina who want to cook while sitting, the kitchen dresser together with the dishwasher can be adjusted to the preferred height (Figure 8). Simultaneously a servo-drive motorized system placed on the kitchen cabinets increases usability.

Figure 8. Kitchen on ground floor level

To summarize, "the Inclusive Housing Lab" demonstrates the design process, building process and perceptual process and the impact of a UD-attitude. Moreover it is a place where we can test architectural design at full scale. In addition it offers end users more information about Universal Design and creates a place for Research by Design. Comfort and elegance are the key words of the process and transform architecture as well as the designed products into Universal Design.

3. Discussion

At a local scale the UD Living Lab gives information, demonstration and offers a place for research. It introduces visitors, students and professionals to the advantages of adaptable housing designed from a Universal Design point of view.[3] The house gives people the experience to feel and see how they can construct or renovate a dwelling that is suitable for a diversity of users at all stages of life. It is literally considered as a laboratory for interdisciplinary research in which people can test and evaluate different options and best possible solutions. Architects, interior architects, product designers, light engineers, occupational therapists, physiotherapists as well as psychologists will be involved to start up inquiries together with research groups at the university, designers, contractors, the business world and user/experts. In the future companies can attend brainstorm sessions and contribute to the search for new concepts for products, applications and services. The house will function as a place for experiments but always with respect to people and good design standards. Research results and insights gained from the demonstration experiments will result in new workshops and courses on inclusive designing. Finally the lab will assist the accessibility offices in offering advices for projects. The generated expertise will be applied for professional training programs in target industries as well as higher education.

On a global scale it is demonstrated that research and design can be intertwined in "Research by Universal Design*ing*" as a kind of inquiry in which design is a substantial part of the research and co-creation process. The actual design of the Inclusive Living Lab forms a way through which new insights, knowledge, practices, spaces or products come into being at different levels and with different stakeholders. For example, the dialogue with the Monuments office offered insights that result in good design with respect to its historical context as well as to usability. Consequently the "Research by Universal Designing approach" can also be used by citizens, policy and decision makers, at large. It allows them to design, stimulate and refine new policies and regulations in real-life scenarios. Potential impacts can be experienced and evaluated before the implementations take place. Innovative knowledge can be generated thanks to the intense collaboration with institutions, government, enterprises, experts, designers and users during the design, building and perceptual process.

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[3] More than 1200 people already visited the demonstration house over the first nine months (March – December 2013) and/or attended one of the training programs.

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