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RESEARCH PAPER

About the nature of design in universal design

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Abstract

Purpose: Studies suggest that the concept of universal design (UD) is not widely accepted and that some of its ideas are received rather sceptically. This article confronts the concept of UD with prevailing notions and practices of design. It examines how UD can be situated relative to design in general, and explores whether elements in the nature of design can help us explain this scepticism. *Methods*: The article confronts writings about how design is understood with the concept and ideas of UD. This confrontation is substantiated with examples from studies of design processes in architectural design practice. *Results*: The confrontation highlights the ambiguity of how UD is framed and presented, ranging from an attitude over something utopian to a normative design domain. *Conclusions*: (1) Besides UD other attitudes are thinkable that address the diversity in human abilities and conditions. (2) The impossibility to really design for everyone may be inherent to design rather than characteristic of UD. (3) Even if UD as a normative design domain were a top priority, the question remains how to assess whether a design is universally usable given the nature of design (problems), and prevailing design practices.

➤ Implications for Rehabilitation

- Understanding disability as originating in the interaction between features of an individual's body and features of his/her environment, as universal design does, implies that rehabilitation specialists need to consider the context in which a person lives.
- Besides striving for independence, self-reliance and individualism, rehabilitation specialists may consider other attitudes to address the diversity in human abilities and conditions.
- Designers do not have direct access to the perspective of the people they design for. Assessing whether a design is universally accessible may benefit from expertise of rehabilitation specialists.

Keywords

Architectural design, design research, universal design

History

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Introduction

A few years ago, the Flemish authorities commissioned a study aimed at mapping and analysing whether and how universal design (UD) is taught in all six architecture programs in Flanders [1].[1] Instead of focusing only on why and how three pioneering professional programs were teaching UD at that time, the study also tried to understand why the three university programs were not [2]. In this article, I revisit the latter, as I feel that this may provide useful insights to start addressing the lack of academic attention for or critical scrutiny of the overarching principles of UD, their understanding, and their placement into practice [3]. The outcome of the above-mentioned study commissioned by the Flemish authorities suggested that the concept of UD as such is not widely accepted and that some of its ideas are received rather sceptically.

In an attempt to understand where this scepticism comes from, I set out to confront the concept of UD with prevailing notions and practices of design. Since the 1970s, design researchers are making efforts to understand design in its own terms [4]. The founding axiom of their research was formulated by Bruce Archer as follows: ''Design has its own distinct things to know, ways of knowing them and ways of finding out about them'' [5], distinct from the commonly recognized scientific and scholarly ones. Nigel Cross advanced this axiom as the ''touch-stone theory'' around which the research program he called for would build ''a 'defensive' network of related theories, ideas and knowledge'': ''We need more research and enquiry: first into the designerly ways of knowing; second into the scope, limits and nature of innate cognitive abilities relevant to design; and third into the ways of enhancing and developing these abilities through education'' ([4], p. 226). To my knowledge, however, insights about the nature of design resulting from design research have rarely been called on to analyze the concept and ideas of universal design.[2]

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[1]At that time these included three university programs and three professional programs.

[2]Other authors have confronted universal design with a critical theory paradigm [6], or with informational and market issues [7].

After briefly introducing the above-mentioned study and its outcome, I therefore examine on the one hand how universal design can be situated relative to design in general, and explore on the other hand whether elements in the nature of design can help us explain the scepticism about universal design. To this end, I revisit writings about how design has been and is being understood in design research and confront these with the concept and ideas of UD. I substantiate this confrontation with examples from studies of design processes in architectural design practice. Issues addressed include the ambiguity of how UD is framed and presented (as an attitude of designers or a normative design domain, as a process or specification of a product), the critique that universal design is utopian versus the indeterminateness inherent to design, and the distance between designer intent and user[3] experience. While I focus in this article mainly on (universal) design in architecture, the analysis may be relevant for other design disciplines as well.

Four reasons not to teach UD

In order to map the situation of universal design in all six architecture programs in Flanders, semi-structured interviews were conducted with the program directors or their representatives, and complemented with a focus group interview with teachers and document analysis of the program guides.[4] The interviews tried to establish the reasons why UD had (not) been implemented, or had (not yet) succeeded in gaining support: the presence of so-called ''pioneers'', the curriculum's aims and goals, the willingness to reform and decision-making in the department were all covered during the interviews. The attitudes towards the concept and potential alternatives were also discussed, as was the wider subject of accessibility and governmental initiatives; these topics, however, were mostly mentioned spontaneously by the interviewees. The structure of the interviews was based on recent findings on institutional change [10,11]. Research on mainstreaming sustainability education provided an extra framework, as UD and sustainability are often mentioned together and indeed share some characteristics [12]. In interpreting the findings, this literature proved helpful as well.

Across the interviews, the program directors and teachers of the university programs brought up four reasons not to teach universal design:

(1) **UD as a concept**: Judging from the interviews, the concept of UD as such is not widely accepted and some of its ideas are received sceptically. Some interviewees view the topic as rather unscientific: it is considered to be a set of good intentions, but rarely surpassing that level. This is in line with the general critique that UD is utopian, and that it is impossible to really design for everyone.
(2) **The specific nature of university education**: All interviewees from the university programs seemed to assume that their academic programs clearly differ from the professional programs. The specific nature of university education is research-based and academic, they argue: students receive a thorough and broad scientific education, which should enable them to integrate the necessary concepts and standards in their designs. UD can be one concept amongst many, but not directive. Nevertheless, interviewees feel that ''accessibility'' is an important societal issue, and that consciousness about it should be a basic attitude, prompted by common sense.
(3) **The program**: An argument against implementing UD that was repeatedly mentioned by the interviewees of the university programs is lack of time. At the level of the curriculum, it is argued, there is no time to introduce new course topics. Moreover, the interviewees point out, the teachers have no time to develop and implement program changes.
(4) **UD, society and the authorities**: As long as ''accessibility'' is not explicitly rewarded – or penalized in design competitions or commissions, the interviewees pointed out, there is little use in investing in it. Government standardization is felt to be important, but scepticism about the growing amount of rules is widespread.

While the interviewees themselves seem to suggest that some of these reasons can be attributed to the specific context of higher education in Flanders, they may be more related to universal design itself, and to how it is understood. For instance, rather than a program or workload problem, the fact that time is not given over to the study of UD may be taken as a symptom of the lack of interest in the topic and the low importance attached to or even scepticism towards it. In trying to understand where this scepticism comes from, I focus therefore on the following questions: how does UD relate to the nature of design (as studied in design research)? And are there elements in the nature of design that can help us explain these reactions?

UD versus the nature of design

In the interviews with program directors and teachers, UD comes to the fore in different guises. On the one hand, some reactions suggest that UD is considered as a set of good intentions, a basic attitude, that seems to be associated with accessibility and functionality. On the other hand, however, UD is considered as utopian, since it is impossible to really design for everyone.

These different guises should perhaps not come as a surprise, given the ways in which UD is portrayed in the literature. The late American architect Ronald Mace, who is said to have coined the term ''universal design'', defined UD as an *attitude*: ''an approach to design that incorporates products as well as building features which, to the greatest extent possible, can be used by everyone'' ([13], p. 1.5). Overall inclusion is thus the ideal to aspire. This does not mean, however, that UD is blind for the reality, in particular for the fact that in practice it is impossible to really design for ''everyone'', that unforeseen problems always can and will arise, and the objectives of UD in reality thus cannot be realized. This limitation is clearly acknowledged: the designer should keep in mind all users ''to the greatest extent possible''. In principle, it is thus important not to exclude anyone *a priori* in the description of the target group and the actual design process. Furthermore, the impossible or the *utopian* is advanced as a determinative characteristic, ''a goal toward which to strive'' ([14], p. 13). At the same time, however, UD is also advanced

[3]The notion of ''user'' is subjected to criticism in design research. Focusing on just the ''users'' of a product may ignore the needs of others affected by its design; see e.g. [8]. Moreover, the term ''user'' reflects a tendency to objectify people as ''test subjects'' rather than human beings with a context, lifestyle and desires that go beyond their physical representation; see [9]. Aware of this critique, in this article I use the term ''users'' as a shorthand for ''people whom designers design for''.

[4]The study took place between February 2008 and February 2009. The individual interviews with program directors or their representatives and the focus group interview with teachers were semi-structured and based on open questions. The document analysis of the program guides and other documents describing the program turned out to contain very little information about UD. Even for the programs that had already implemented UD, it was difficult to tell from the program guides. Implementation and (especially) vision were hardly made explicit in these documents. Therefore, the findings reported here are based primarily on the interviews. Note that the views reported here are those expressed by the interviewees and not necessarily shared by the author. A more detailed description of the study, its set-up and results can be found in [1].

as a *set of specifications* of what is being designed. The seven principles of UD, for instance, read as criteria to be met by products, spaces and services: they should allow equitable use, be flexible in use, allow for simple and intuitive use, communicate the necessary information effectively to the user, minimize hazards, require low physical effort, and provide appropriate space for approach and use [15].

For Newton D'Souza these different ways in which UD is framed and presented, make UD a melting point between cross paradigms: ''[. . .] Universal design can come under functionalist paradigm (because it caters to utility), pragmatic (because it is instrumental in nature), positivistic (because it strives for universal principles), normative (because it prescribes certain rules) and critical theorist paradigms (because it gives voice to the oppressed)'' [6]. As a result, he points out, universal design still remains largely atheoretical in the sense that UD researchers do not explicitly affiliate themselves to any form of theoretical paradigm or other basic orientation.

In what follows, I will confront these different ways in which UD is framed and presented – as an attitude, an on-going process, a set of specifications – with literature on the nature of design. To this end, I draw mainly on the work of design theorists Horst Rittel and Melvin Webber on the wicked nature of problems in planning and design, because it has been taken up as an appropriate formulation of problem-solving in many fields of practice, including design [16]. In an article entitled ''Dilemmas in a General Theory of Planning'', the authors pointed out that problems in planning and design are wicked, i.e. fundamentally un-amenable to the techniques of science and engineering, which dealt with ''tame'' problems [17]. In doing so, they advanced a fundamental argument to move away from the 1960s' desire to ''scientise'' design towards the ambition to understand design in its own terms ([4], p. 226). To a lesser extent, I also draw on the work of others, including design methods movement pioneer John Christopher Jones, philosopher Donald Schön and architect (ural researcher) Dana Cuff.

An approach to design

As outlined above, universal design is framed as an attitude, as an approach to design – both in the literature, and by the program directors and teachers interviewed. What does research on the nature of design tell us about the role of an attitude, an approach to design?

In their oft-cited formulation of the wicked nature of problems in planning and design, Rittel and Webber identify ten distinguishing properties of wicked problems. Three of these seem particularly relevant here [17]:

- **Proposition 1: ''There is no definite formulation of a wicked problem''**: wicked problems are ill-defined in the sense that their description does not contain all the information one needs for understanding and resolving them. The information needed to understand a wicked problem depends upon one's idea for solving it. In other words, the formulation of a wicked problem *is* the problem. Formulating the problem and conceiving a solution are identical processes, since every specification of the problem specifies the direction in which a solution is considered.
- **Proposition 8: ''Every wicked problem can be considered to be a symptom of another problem''**: If one considers problems as discrepancies between the state of affairs as it is and as it ought to be, resolving a problem starts with searching a causal explanation of the discrepancy. Removing that cause poses another problem of which the original problem is a ''symptom'', and which in turn can be considered the symptom of still another, ''higher level'' problem.
- **Proposition 9: ''The existence of a discrepancy representing a wicked problem can be explained in numerous ways. The choice of explanation determines the nature of the problem's resolution''**: Because wicked problems are essentially unique (proposition 7) and every solution is a ''one-shot-operation'' (proposition 5), it is impossible to put an explanation to a crucial test. The choice of explanation is thus arbitrary in the logical sense. In actuality, it is guided by attitudinal criteria. One's ''world view'' is the strongest determining factor in explaining a discrepancy and, therefore, in resolving a wicked problem.

If we accept Rittel and Webber's characterization of wicked, c.q., design problems, the importance of an attitude or approach to design should not be underestimated. Because the description of a design problem does not contain sufficient information to resolve it, the attitude with which it is approached strongly determines how the problem is understood and thus how it will be resolved.

Characteristic of UD as an attitude, as an approach to design, is its strong emphasis on promoting and enabling independence, self-reliance and individualism, especially for disabled and older people. UD starts from the premise that ''accessible systems, reliable information sources, and enabling environments can maximize choice and enhance the ability of the individual to live independently'' [18]. An exception to this rule seems to be guideline 7d under UD principle 7, which stipulates to ''provide adequate space for the use of assistive devices or *personal assistance*'' (emphasis added) [15]. Yet, apart from this exception, independence, self-reliance and individualism seem to be the overarching principles that characterize UD as an attitude or approach to design.

These principles can be traced back, at least in part, to the Independent Living Movement, one of the influences leading to UD ([19], p. 6.2). With origins in the U.S. civil rights movement of the late 1960s, the Independent Living Movement grew out of the Disability Rights Movement, which began in the 1960s. It started as the result of grassroots efforts to influence disability policies, and defined independent living as follows: ''The process of translating into reality the theory that, given appropriate services, accessible environments and pertinent information and skills, severely disabled individuals may actively participate in all aspects of society'' [20]. The movement recognized ''independence'' through dependence upon social and technological support, thus presenting a vision of ''independence'' as *mutual dependence* of *interdependence* [21]. In the literature on UD, however, the notion of ''independence'' seems to have shifted from dependence upon social and technological support to dependence on technological support only (or primarily). In writing about UD in the context of care homes, for instance, John Zeisel stresses: ''Details in the environment such as handrails and floors that prevent slips and falls contribute to the independence and autonomy of residents, because *they support each person's ability to do things on their own*'' ([22]. p. 8.6, emphasis added).

Rather than promoting people's independence, in the sense of their ability to do things on their own, several contexts can be thought of in which acknowledging and supporting people's interaction would be a more beneficial attitude. A first context worth mentioning here is that of the Maggie's Cancer Caring Centres, a series of places in the UK which aim to empower anyone affected by cancer to live with, through and beyond the disease. Key to this empowerment is bringing together professional help and communities of support in an environment that stimulates social interaction amongst people. Interviews with architects and visitors of Maggie's London by architect(ural researcher) Margo Annemans confirm the importance of this

interaction at several levels [23].[5] First and foremost is the interaction between people affected by cancer: ''not being on your own at home, worrying, having someone to talk to, and feeling 'normal''' are brought up by visitors as being key to the support the centre provides. Second, visitors interact with caregivers, whose availability is spatially translated in the absence of a reception desk. As an architect who designed a Maggie's Centre points out: ''not having a reception desk means that [...] you can see somebody, that you already have a personal relationship ready. Somebody comes up to you to see how you do and you can make a cup of tea and you can already start interacting. [...]'' [23]. Finally, the existence of a Maggie's Centre can help to establish an improved, renewed relationship between cancer patients and their family. Logically friends and relatives are worried about the ill. When they know she is at Maggie's and they have seen the centre, this is often a relief for them, which in its turn is comforting for the patient. Judging from these interviews, in this context designing independence, self-reliance and individuality may not be the most beneficial design attitude either.

A second context that may be relevant here concerns the use of interactive consumer products by older people. Alison Burrows et al. [24] investigated to what extent the initial stages of a user's interaction with a new product show opportunities to improve its inclusivity. These stages, referred to as the Out-of-Box Experience (OoBE), include purchase decision, packaging and unpacking, set-up or installation, configuration, initial use and assistance [25]. Whereas older adults are frequently considered a homogenous group, mostly segmented according to age and abilities, Burrows et al. [24] tried to gain a more nuanced insight into this user group and their motivations for using interactive consumer products. Among people in the older age group (over 76 years old), the authors found a tendency to avoid the OoBE completely, often relying on friends, family or experienced personnel to unpack and install their new products. As the main reasons for avoiding this stage of product interaction the majority of the individuals interviewed cited time efficiency, fear of making serious errors, and a lack of familiarity with the devices and their installation requirements. Interestingly, some of the interviewees did not seem to mind this dependence on the help of friends or family, as it provided them with a good excuse to ask them to stop by. For these people, making the OoBE more inclusive so as to enable them to purchase, unpack, set-up or install, configure, and start using a consumer product *on their own*, might thus come with less visits from family or friends.

Yet in other contexts a balance might be needed between promoting people's independence, and supporting their interaction. A case in point is pediatric oncology. Research by architect Gemma Koppen and psychologist Tanja Vollmer provides strong arguments for designing hospital environments that accommodate not only the child that is ill, but various configurations of the child–parent-unity [26]. Vollmer points out that ''A child with cancer needs the proximity of his parents day and night. In this way it can come to terms with the disease and is distracted from the pain. But a child should also be stimulated in its autonomous development, especially children above the age of 10. Children should be able to develop themselves independently'' [27]. In order to create enough space for this autonomous development when the parent sleeps with the child, Koppen and Vollmer developed a flexible hospital room: a room that can be visually and acoustically separated into a part for the child and a part for the parent. Vollmer explains ''In this way the child's sleep, which is important for the healing process, is not interrupted and privacy is offered. The room even has a workplace for the parent, who often is already busy with hospital visits for months''.

The point I want to make here is not that the overarching principles of independence, self-reliance and individualism, which characterize UD as an attitude or approach to design, are unimportant, but rather that they seem to be taken for granted, without considering other thinkable attitudes that might provide a valuable alternative. The examples outlined above suggest that designing for independence, in the sense of being able to do things on your own, may not be the only (and not always the most beneficial) design attitude or approach to address diversity in human abilities and conditions. Rather than taking these principles for granted, designers thus may want to consider several different attitudes and choose the one that is most appropriate in the given design context.

Utopian

The second guise in which UD is found relates to its utopian character, the fact that it is impossible to really design for ''everyone'', and that there will always turn out to be somebody whose perspective has not been taken into account. As mentioned above, this feature of universal design is not only clearly acknowledged, but even advanced as a determinative characteristic [14]. In this context, some authors use terms like ''universal design*ing*'' [28], or ''design for *more*'' [29], so as to capture in words the unceasing and dynamic endeavor.

To start addressing this second guise, I draw on a case study of the design and use of Museum M in Leuven by Stéphane Beel architects. The case was studied by inventorying and analyzing publications about the building, interviewing the project architect and the museum's architecture guide, and visiting the building accompanied by disabled persons.[6] Striking about this museum is the main entrance since visitors have to descend to enter the museum (see Figure 1, left). At the time when museums were a privilege for the bourgeoisie, visitors had to ascend to enter; think for instance about the British Museum in London. The descent before entering Museum M is supposed to symbolize its accessibility and openness to everybody. Stéphane Beel found it important that different groups of visitors do not have to separate; through the integration of a ramp in the staircase, a wheelchair

[5]The interviews were conducted as part of a study that aimed at exploring as many aspects and nuances of a healing environment as possible. In this context, a group discussion was conducted with four users of the Maggie's London (three cancer patients and one whose husband died of cancer), and an interview was conducted with the associate at Rogers Stirk Harbour + Partners who lead the design and building of the centre. Both were audio recorded, transcribed and coded using qualitative data analysis software (Atlas.ti). First the group discussion was processed using open codes. With the results of this first analysis in mind, the interview with the architect was coded according to these categories. For more details about the study, see [23].

[6]The aim of this case study was to gain nuanced insights in how an architect's original intentions are experienced by (disabled) users, and demonstrate how such insights may enrich our understanding of architecture. Museum M was selected as a case for two reasons: (a) it is a well-known piece of contemporary architecture: since its opening, it has been praised as an important work of architecture by the professional press, and attracts a large volume of visitors; and (b) the architect and his team paid explicit attention to persons with an impairment from the early design decisions on. The case study relied on multiple methods and sources: inventory and analysis of publications about M, and interviews with the project architect, in order to fully grasp the architects' conceptions of the museum; interviews with M's architecture guide, who is confronted with the building and its visitors on a daily basis; and visits to the museum accompanied by a wheelchair user and a vision impaired person in order to gain access to (disabled) visitors' experiences. For more details about the case study, its methods and results, see [30].

Figure 1. Main entrance to Museum M – descending stairs and ramp (left) and interrupted banister (right) (© Caroline Van Doren).

user and an able-bodied person can enter together by this entrance.

When the ramp crosses the stairs, the banister that supports and guides people in descending the stairs stops (see Figure 1, right). This is necessary for the continuation of the ramp, but for a vision impaired person it is difficult to find the next banister. Besides the continuation of the ramp and stairs, the color of the entrance seems to cause obstacles as well. Visitors with and without vision impairment both notice that the white color of the stairs and ramp is not ideal when the weather is very sunny. A vision impaired person experiences the flight of stairs as one white inclined plane. He is unable to distinguish the different stairs and the combination with the ramp makes it even more difficult and confusing. Yet, visitors with perfect eyesight may not feel comfortable about entering either. The ramp is not very visible for wheelchair users, unless you follow the dots in the middle of the large stones of the ramp.

In designing the entrance of Museum M, the architect had good intentions, yet the way people experience the resulting space differs from these intentions in various ways. If we look at literature on the nature of design, however, this may have not so much to do with UD, but rather with the nature of design itself. Unlike in pre-industrial societies, in our society the person who conceives a space (or a product or service), is often someone else than the person who produces it and the one who will use or live in it [31]. In other words, designer, producer and user are typically different persons. An important implication of this split is that the designer does not have direct access to the perspective of the one s/he is designing for [32], rendering the designer's involvement and empathy of major importance ([33], p. 125). Because designer and user are no longer one and the same person, at the heart of designers' thinking is always their involvement and personal solicitude with regard to the design, often based on the direct experiences of the designers themselves [34,35].

The designer's direct – personal, embodied – experiences indeed seem to play an important role in this context. Stéphane Beel, for instance, has been diagnosed with a neurological disease, which he feels has made him particularly sensitive [36,37]. This may explain at least in part why, in designing Museum M, Beel and his team paid explicit attention to mobility impaired persons from the early design decisions on. Another example concerns the experiences of Carlos Mourão Pereira, a Portuguese architect who lost his sight and continues designing in this condition [38].[7] For Pereira, becoming blind is an inspiring learning process about, amongst others, the multisensory qualities of the built environment. Trained as an architect, he acknowledges a visually oriented interest in architecture, and admits that his knowledge of the broader human sensorium used to be fairly limited. When he lost his sight, Pereira seized the opportunity to expand his non-visual knowledge about the built environment. Eventually, this embodied knowledge helps him create richer architecture as he incorporates shapes and materials for their multisensory potential. In his design of a sea bathing facility at the Portuguese coast, for instance, the rounded shapes of the basin are chosen for their haptic qualities and seaweeds growing in the smaller basins are integrated for their olfactory and tactile qualities (see Figure 2).[8] Together these examples illustrate the power of designers' direct experiences in shaping what they design. The large majority of designers, however, do not have any relevant personal experiences in being mobility impaired or blind. Or as an architecture student trying to design housing for disabled people formulated it: ''how can I design for others if I only have my own experience to rely on?'' [39].

The fact that in our society, as opposed to pre-industrial societies, designer, producer and user are typically different persons, has a second important implication. For it implies that the designer does not design *in situ*, in direct contact with the material, but always in and through one or more representational media (like sketches, models, etc.). This medium offers a kind of ersatz feedback on how the user will experience the object or space being designed. Moreover, it is not neutral, in the sense that it sets limits to what qualities of the design can be addressed during the design process. For instance, Carlos Pereira quickly came to the conclusion that representational media used in architectural design are visually oriented. Thus, he had to start

[7]The study of Pereira's design practice is based on interviews with him and his coworkers, analysis of his design tools and participant observation of building visits by him. For more details about the study, its methods and results, see [38].

[8]A similar evolution can be observed in the work of Christopher Downey, an American architect who also lost his sight and continued designing afterwards. Even more than for Pereira, for Downey the process of becoming blind related first and foremost to acknowledging and overcoming a visual bias in his earlier work. Since he lost his sight, sensory richness for Downey means not only expanding his attention to different senses, but also striving for differentiation in acoustic, tactual or visual qualities *an sich*. See [38].

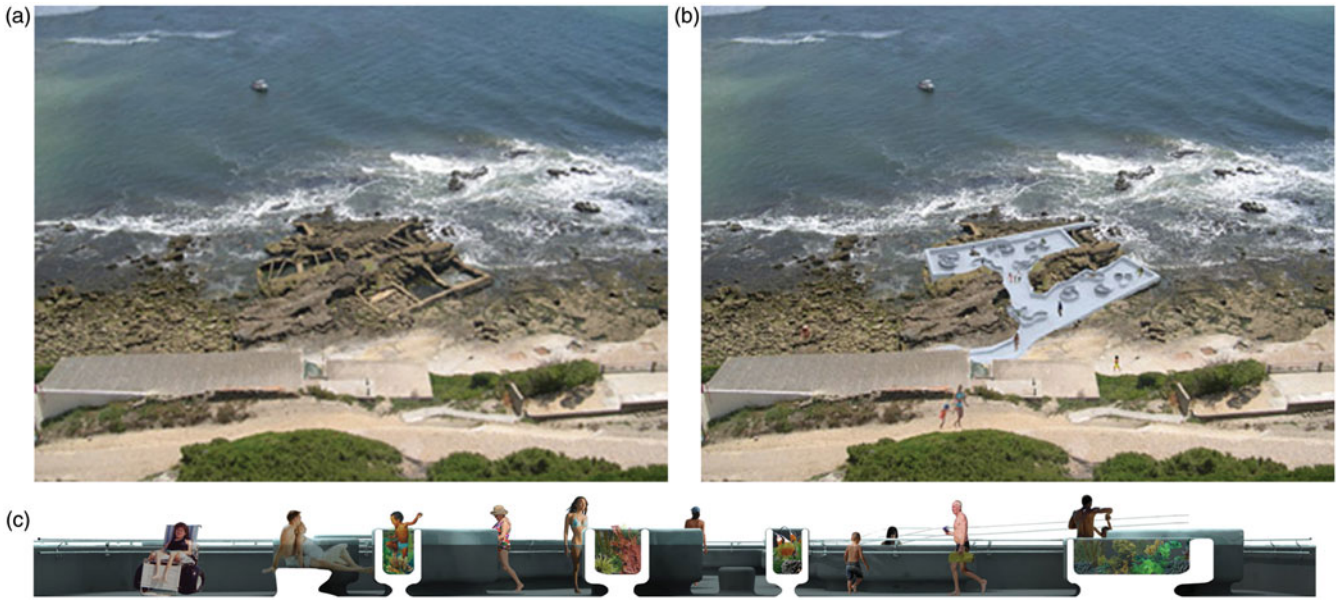

Figure 2. (a) Sea Bathing Facility, Lourinhã, Portugal; original situation, (b) proposal and (c) section (© Carlos Mourão Pereira).

looking (and is still looking) for alternatives that are not only accessible to himself, being blind, but also allow him and his co-workers to address non-visual spatial qualities of the spaces they design.

And yet, even if designers did not design in and through representational media, there still might be a difference between their intentions and people's actual experience of what they design. Nathan Crilly et al. [32] describe this as follows: ''Designers shape [...] artefacts to exhibit certain features, and they can intend these features to elicit certain interpretations. As consumers (defined here to include users and other stakeholders) encounter artefacts, their interpretations may correspond with those that were intended, but might also differ from those intentions in many varied ways. Interpretation cannot be reliably controlled because different people will construct different meanings depending on factors such as context, motivation and values''. This observation can be linked again to the wicked nature of design problems, referred to above. Of the 10 distinguishing properties of wicked problems, Rittel and Webber have identified, a fourth one is particularly relevant here.

- **Proposition 4: ''There is no immediate and no ultimate test of a solution to a wicked problem'':** any solution to a wicked problem, when it is implemented, will generate waves of consequences over an extended period of time, some of which undesired; and there is no way to trace all waves of repercussions through all the affected lives ahead of time or within a limited time span [17].

What does this distinguishing character imply for the discussion about UD and its utopian character – the fact that it is impossible to really design for ''everyone'', and that there will always turn out to be somebody whose perspective has not been taken into account? If there is no direct and no ultimate test for the solution to a design problem, questions arise as to what extent this utopian character is specific to universal design, or rather is inherent to the nature of design in general.

UD as design specification

Which brings us to the third guise of UD: besides an attitude of the designer, and an on-going process, a horizon to move towards, UD also appears as a set of specifications of the designed product or space. Most striking in this respect are the principles of UD, formulated by the Center for Universal Design at North Carolina State University.

In formulating these principles, the Center tried to address the lack of established criteria that define what makes a design most usable, which UD design had been suffering from ([40], p. 10.3). Before, the only usability criteria were found in codes and standards. The latter apply only to specific products and environments, and tend to provide only minimum requirements to accommodate disabled people while falling substantially short of ideal conditions. Instead, ''guiding principles [were] needed that articulate the full range of criteria for achieving universal design for all types of designs, as well as clarify how the concept of universal design may pertain to specific designs under development and suggest how *usability* of those designs should be maximized'' ([40], p. 10.4, emphasis added). The Center published version 1.1 of the Principles of Universal Design in 1995, followed by version 2.0 in 1997. Each of the seven principles is defined and followed by a set of guidelines that describe the key elements that should be present in a design that adheres to the principle.

In this third guise, UD appears as what Donald Schön calls a design domain, i.e., a set of ''elements, features, relations, and actions, and of norms used to evaluate problems, consequences and implications'' ([41], p. 95–6). In the case of UD, this design domain seems to relate especially to the use of what is being designed, be it a space or a product.

To start with, use is but one of the normative design domains in architecture (and in other design disciplines, for that matter): during design, architects draw on a repertoire of design domains to fulfill a variety of constructive, descriptive and normative functions, including but not limited to program/use (functions of buildings or building components, uses of building or site, specifications for use), siting (features elements, relations of the building site), organization of space (kinds of spaces and relations of spaces to one another), form (shape of building or component, geometry, markings of organization of space, experienced felt-path of movement through space), structure/technology (structures, technologies and processes used in building), scale (magnitudes of building and elements in relation to one another), cost (dollar cost of construction) and building character (kind

Figure 3. Design of a new administrative center – freestanding volumes in a park with public functions on bel-étage (© ONO architecten).

of building as sign of style or mode of building) ([41], p. 96). This repertoire of design domains is acknowledged by the authors of the Principles of Universal Design, who conclude the principles' description as follows: ''NOTE: The Principles of Universal Design are not intended to constitute all criteria for good design, only universally usable design. Certainly, other factors are important, such as aesthetics, cost, safety, gender and cultural appropriateness, and these aspects must also be taken into consideration when designing'' [15]. Indeed, if architects (and other designers) are to acknowledge and address the diversity of human abilities and conditions, these other normative design domains may be relevant as well.

By way of example, I refer in this context to the design of a new town hall for a Flemish municipality on the premises of its former town hall. For this design a design competition was organized amongst five architecture firms. One firm's design process was submitted to a three-month ethnographic study, combining participant observation with video.[9] In its design brief, the municipality advanced two major points of attention: the design should preserve the larger green environment, and guarantee ''optimal accessibility'' in the sense of adhering to actual norms. In order to preserve the unity of the green environment, the firm under study decided to raise the building and make (or keep) the ground floor as continuous as possible (Figure 3). This very design decision was intended to make the green environment as open as possible, and at the same time had important consequences in terms of usability and accessibility of the building. As this example illustrates, design decisions often have consequences and implications that cut across design domains [41]. Moreover, the designer's repertoire has a structure of priorities for attending to features of situations [41]. In this early stage of this particular design process, the siting seemed to have a higher priority than the usability, c.q., ''optimal accessibility'', and yet preserving a green park environment is likely to benefit people with different ages and abilities.

Yet, even if we focus only on the use of a building (or product), the question arises how the consequences and implications for this normative design domain are assessed. According to Rittel and Webber, the assessment of a solution to a design problem may differ depending on who assesses.

- **Proposition 3: ''solutions to wicked problems are not true-or-false, but good-or bad'':** Normally, many parties are equally equipped, interested and/or entitled to judge the solutions although none has the power to set formal decision rules to determine correctness. Their judgments are likely to differ widely to accord with their group or personal interests, their special value-sets and their ideological predilections [17].

Instead of answering our question, Rittel and Webber's proposition thus presents us with another question: who judges the usability of a building feature (or product)? who decides whether it can be used by all people to the greatest extent possible, as Ron Mace would have formulated it ([13], p. 1.5), or whether, ''the design is usable and marketable to people with diverse abilities'', as stipulated by the first UD principle [15]?

According to Wolfgang Preiser, universal design performance can be measured through Post Occupancy Evaluation (POE), the actual evaluation of a building's performance once in use by human occupants [43]. Such evaluation is of utmost importance to address the interrupted feedback loop between design(er) and use(r) referred to above. However, prevailing norms in the construction industry do not encourage interaction between the commissioning, design, construction and use of building, which results in poor feedback loops between design(er) and use(r) [44]. Moreover, during the design process, designers interact with many other actors. Despite the tendency to consider the architect as author of what is being designed, either producing a unique vision alone, or directing other actors who assist in producing that vision [45], in reality the architect is only one component of the ''messy reality'' of design [46,47]. In 1991, Dana Cuff tried to estimate architects' interaction with others throughout the design process based on her own observations in architectural design practice. Her estimate suggests that interaction is intense throughout the design process, and that the architect's level of interaction is higher than any other participant's ([46], pp. 173–5). Since then, the design situation has only become more complex, and the number of actors involved has grown. The rise of a risk and regulatory society, combined with global challenges like climate change and population aging, introduced newly emerging professional actors in project design and delivery (e.g. project managers, sustainability consultants, accessibility advisors), some of whom take over functions previously the preserve of architects [47]. Given these poor feedback loops between design and use in architecture, and the growing complexity of design teams, it remains unclear how and by whom universal usability is assessed and decided about during the design process.[10]

Discussion

A study on the integration of universal design in architectural education in Flanders suggested that the concept of UD as such is not widely accepted and that scepticism exists about some of its ideas. In an attempt to understand where this scepticism comes from, I focused in this article on two questions: how does UD

[9]Two researchers were involved in the ethnographic study: one with a background in social sciences, observed the design practice ''from outside'' while the second one, with a background in architecture, acted as member of the design team and experienced the design process first-hand through participant observation. The study employed a variety of data collection methods, including direct observation, video recording, semi-structured interviews, and analysis of documents and artefacts, such as the design brief, drawings, etc. This yielded a very rich data set, including 25 h of audio and 66 h of video recordings captured during 21 design team meetings; site visits and follow-up meetings, and 284 design documents used and/or produced by the five team members. For more details about the study, its methods and results, see [42].

[10]This question is actually a particular case of a very general question that is relevant to every activity exhibiting normative dimensions: where are standards to be set? And who is in charge of the issue? For a more in-depth discussion of this general question, see [48].

relate to the nature of design as studied in design research? And are there elements in the nature of design that can help us explain these sceptical reactions?

By combining literature on the nature of design with examples from studies of design processes in architecture (and sometimes other design disciplines), I have tried first of all to unravel the ambiguity in how universal design is framed and presented relative to the nature of design.

In doing so, I have highlighted the importance of attitudinal aspects in addressing a design problem, and have argued that, besides the principles of independence, self-reliance and individualism that characterize UD as a design attitude, other attitudes are thinkable to address the diversity in human abilities and conditions. This may explain why the teachers and program directors interviewed in the above study considered UD as one concept amongst many, but not directive.

Furthermore, I have confronted the utopian character of universal design with the indeterminateness inherent to design, and the inevitable distance between designer intent and user experience. In this way, I have shown that the impossibility to really design for everyone, as referred to by the teachers and program directors, is inherent to design rather than characteristic of universal design.

Finally, I have looked at UD as a normative design domain, which focuses in particular on the use and usability of what is being designed. Interviews with teachers and program directors suggest that, in architecture, this normative domain does not appear very high in the structure of priorities adopted in design competitions or committees (and thus design teams). Yet, even if use and usability were a top priority, the question remains how to assess whether a building feature ''can be used by all to the greatest extent possible'' given not only the nature of design (and design problems), but also prevailing practices in architecture and the construction industry at large.

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