



## Documenting handicap situations and eliminations through Universal Design Patterns

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### REVIEW

Please cite this paper as: Froyen H, Verdonck E, De Meester D, and Heylighen A. Documenting handicap situations and eliminations through Universal Design Patterns. AMJ 2009, 1, 12, 199-203. Doi 10.4066/AMJ.2009.158

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### Abstract

According to contemporary academic and social insights, human functional limitations and handicaps are not exclusively the result of the physical and / or mental characteristics of the individual (medical model), but they can just as well be a consequence of a maladjustment of the social and physical environment (conflict / social model). This radical reversal of focus from person to environment, or in other words, from the assessment that *the person is impeded* to the insight that *the physical and social environment is an impediment*, has far-reaching consequences for the designing of human-made environments.

The recent *Universal Design* paradigm extends beyond accommodating 'modal' users and aims to include the real diversity of user populations, including those with physical and / or mental impairments and functional limitations. To achieve this, a large amount of design information in connection with human dis-abilities (limitations and possibilities) is required.

Together with prescriptive laws and regulations, designers need descriptive information about; on the one hand, CONFLICTS between users and built environments, and on the other hand, empirically evident design RESOLUTIONS. In response to this need, the paper advances the development of specific *Universal Design Patterns* (UD Patterns) in order to collect and organise this information for decision makers and for designers.

**Key words:** accessibility, disability, evidence-based design, Universal Design, Universal Design Patterns, users / experts

### Introduction

At the beginning of the twenty-first century we can state that the historical and contemporary contribution of medical science and technology relating to both the demographic ageing of the population and to the support of the individual throughout the entire life cycle is impressive. At the same time, this development also exposes the dramatic gap between the successful medical and paramedical accomplishments relative to intrinsic physical and mental human 'dis-abilities' (limitations and possibilities), and the meagre or non-existent provision of complementary extrinsic and adapted environmental elements. This is obvious, for example, when we compare the fast developments in the area of *ostomy surgery techniques* since 1950 with the currently very scarce or non-existent toilet facilities for stoma care away-from-home.

If for example a facility like the colostomy shelf is not provided in public toilet spaces, it will be difficult for anyone with a colostomy to store all necessary supplies and to clean their stoma and change or empty a bag or pouch. In key statistics from accessible toilet audits of 101 facilities in England, Julienne Hanson, Jo-Anne Bichard, and Clara Greed note: 'The most common fixture found to be missing from accessible toilets (97%) was the inclusion of the colostomy shelf' [1]. This is true although provision for a colostomy and general shelf has been included in the UK design guidance since 2001.

Furthermore, designers must not only research and incorporate suitable facilities for users with permanent or temporary physical and / or mental functional limitations, but they must also focus on the much broader totality of handicap *situations*. These handicap situations are not necessarily medically-related but are often a consequence of poorly adjusted designs, sloppy execution or bad maintenance. The English architect, Selwyn Goldsmith, describes in that regard the 'architecturally disabled' as those who are 'disabled because the architect who designed the building did not anticipate their needs, or did not care about them' [2].

### Background

The contemporary call for inclusive and integral accessibility of all public facilities and places for all citizens, has originated in essence from the post-war (World War II, 1940-1945) civil rights and emancipation movements. At the same time, from the 'independent living' movement, requirements were made relative to social and physical accessibility.

These lines of force are now visible in two related transitions. First, a shift in the perception of disability, away from an exclusive 'medical model' – in which the physical and / or mental impairments of the individual were determinative – to a 'biopsychosocial model' in which inadequacies in design are also made partially responsible for the exclusion of people and for handicap creation.

Secondly, in a shift in academic and professional attitudes away from 'Design for Special Needs' with stigmatising aids and adaptations for the handicapped, designers are moving toward 'Design for All' (Universal Design) and toward 'the ethos and aesthetic of enabling mainstream design'. Decision makers, designers and manufacturers have come to understand that they also can and must make an important contribution to the process of handicap elimination.

**A shift from Medical model to Social model**

In May 2001 the World Health Organisation adopted the International Classification of Functioning (ICF), which for the first time fully subscribed to the above-mentioned shift in the perception of disability. The new ICF [3] is a conceptual framework that provides standardised terminology and classification of human functioning and human disabilities under four large categories, namely Body Functions, Body Structures, Activities & Participation, and Environmental Factors.

The gradual shift in the perception of the partial cause of disability from the individual person (the medical / rehabilitation approach) or the social interaction between people (interaction approach), to the confrontation (conflict) of the individual with the organisation of society, including environmental factors, and the structure of the socio-spatial environment more particularly, is described by Samoy and Lammertyn [4] as a 'Copernican revolution'.

**Transition to the Universal Design paradigm**

Explicit focus on the interplay between design and (dis-)ability, leads to new approaches in the field of Information & Communication Technology, product design, architecture, landscape architecture, and urban planning. Specifically, two competing overall design approaches need further explanation. First of all, there is the concept of 'Design for Special Needs' and secondly there is 'Design for All' or the Universal Design paradigm.

The design of the built environment was dominated for centuries by the target group of the 'average users', excluding a-modular and 'distorted' bodies [5]. Even the dominant discourse of 20<sup>th</sup> century modern architecture and urban development still propagated a geometrically pure and rational industrial design for the prototype of the symmetric and athletic Vitruvian body, with the measurements of a young adult male *modulor* [6].

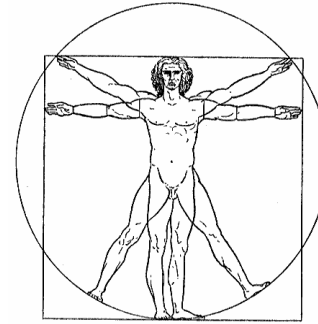


Figure 1. Leonardo Da Vinci's Vitruvian Man (1492).

In the second half of the 20<sup>th</sup> century an important change finally occurred, and under the motto of 'Design for Special Needs', specific provisions for specific target groups were gradually added. Quit recently and finally, at the beginning of the 21<sup>st</sup> century, 'Design for All' or Universal Design – as a social, academic and professional movement toward human-centred design with the real diversity of users in mind – is gaining momentum.

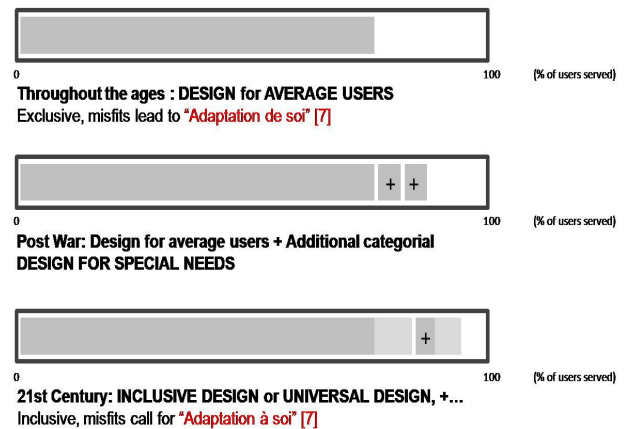


Figure 2. Design approaches from an historical perspective (Froyen and Verdonck)

Jane Alexander, in her introduction to 'Strategies for teaching Universal Design' clearly describes the Universal Design concept:

The concept of universal design goes beyond the mere provision of special features for various segments of the population. Instead it emphasizes a creative approach that is more inclusive, one that asks at the outset of the design process how a product, graphic communication, building, or public space can be made both aesthetically pleasing and functional for the greatest number of users. Designs resulting from this approach serve a wider array of people including individuals with temporary or permanent disabilities, parents with small children, and everyone whose abilities change with age. [8]

Since the experience of disability is now recognised as a universal human experience throughout the circumstances and the stages of life, and since artefacts and built environments are seen as potentially enabling or disabling factors, evidence-based design approaches gradually extend



beyond the health-care field and into the global human-made environment.

Together with prescriptive laws en regulations (specifying conventional design solutions which have worked well before), designers need descriptive information (evidence-based, specifying instead the function and the performance that the solution must provide), leaving creative space for innovative solutions in the light of integral and inclusive Design for All.

### Universal Design (UD) Patterns

Presently, designers' data needs are being met either by designers themselves having to develop data from first principles for each project or by 'comprehensive generic approaches' [9]. Part of our applied research consists of the development of specific UD Patterns in order to collect, generate and organise this comprehensive generic information. Inspiration for the development of UD Patterns is drawn from *Design Patterns: Elements of Reusable Object-Oriented Software* [10] for software architects, as well as from the seminal *Pattern Language* concept [11].

UD Patterns accurately capture descriptions of the 'why' for each design aspect. By their descriptive nature, they also contribute to a broad user-centred design and building culture that complements the prescriptive national and international laws and norms. For the development and the continual updating and improvement of UD Patterns, we propose that conventional empirical research be combined with 'commons-based peer production' [12] by users / experts, and with a broad exchange of Open Content information and communication via the Internet [13].

UD Patterns provide structured and relevant information about CONFLICTS (Problem Definitions) experienced in handicap situations by users, whether they have specific and permanent limitations or not, and related empirically supported RESOLUTIONS, i.e. meaningful combinations of design aspects (Architectural / Technological Solutions) which, in a multitude of circumstances, have shown to accommodate a diversity of users.

The checklist of the user-environment CONFLICTS is originally based on the five-chapter scheme represented in the Dutch architectural design guide 'Geboden Toegang' [Access Provided] [14]. A specific sixth category of Modal users (average, standard) is added in our research process, and highlights the mainstreaming of Universal Design and the emphasis on potential handicap situations for all users [13].

Design-relevant categories of users

- 0.0 Modal users (average, standard). This includes users who are tired, pregnant, stressed, absent-minded, ill or injured, undergoing medical treatment, under the influence of alcohol or drugs, as well as travellers with a pram or with heavy or sizeable objects.
- 1.0 Users with neuromusculoskeletal and movement related functional limitations.
- 2.0 Users with sensory limitations.
- 3.0 Users with organic defects.

- 4.0 Users of exceptional size.
- 5.0 Users with mental and / or psychological limitations.

As relatively autonomous and small databases, each of the hundreds of UD Patterns has an identical structure [13, 15]:

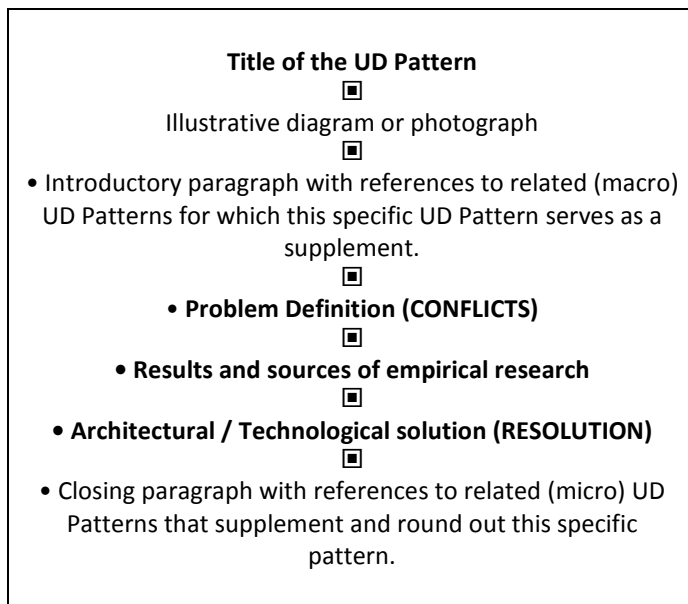


Figure 3. Typical structure of UD Patterns

In addition to the UD Patterns, our overall research comprises six complementary components of a methodological approach: Empirical research – Simulations – Users / experts in collective design processes – Integral Quality Control – Post Occupancy Evaluation – Universal Design Education & Research.

Three distinct parties are involved in the process of generating and updating UD Patterns [15]:

- The Research & Development Team. A multi-disciplinary team with specialists from different medical and paramedical disciplines, with architects, interior architects, engineers, product designers, communication specialists, IT specialists, and psychologists.
- Users / Experts. A user / expert can be anyone who has gained natural experience in dealing with the challenges of our built environment [16].
- Designers and Decision-makers in the structures of building production [17].

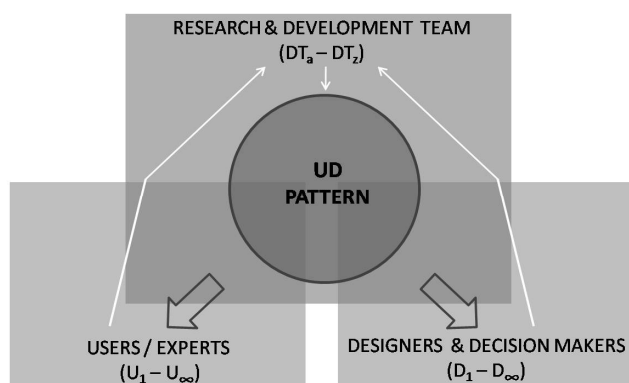


Figure 4. The process of generating and updating UD Patterns (Froyen and Verdonck)

In principle, the Research & Development Team will take the initiative in generating or updating specific UD Patterns, but Users / Experts can also detect and communicate misfits in their interaction with objects, urban spaces, and buildings. Finally, Designers and Decision-makers in the process of building production can use the selected UD Patterns as design support tools, and / or can analyse the formulated conflicts and can document updated technological / morphological resolutions.

Feedback from all six of the complementary components of the overall methodological approach mentioned above is channelled back into the UD Patterns.

### Conclusions and future work

Including the real diversity of user populations in the design of the built environment requires a large amount of design information in connection with human disabilities (limitations and possibilities). In order to collect and organise this information for decision makers and designers, we are developing specific *Universal Design Patterns*. By way of example, we developed a UD pattern of a (semi-)ambulant accessible toilet for stoma care away-from-home [17].

We view the proposed UD Patterns not only as carriers of information, but also as Open Content forums and as tools in the on-going search for temporal social, academic and professional consensus [13].

Direct involvement of end-users is essential in the search for social consensus, and participation enriches the content of design data. Many people with visual impairments, for example, are experts in the appreciation of the multi-sensorial qualities of built environments, beyond the dominant 'looks' and the classical aesthetic appearances [18].

A first and major barrier to overcome is the systematic exclusion of the end-users from the design process. Additionally, an important prerequisite for the methodical research of the systematic elimination of handicap situations in the (everyday) built environment is that buildings are not viewed as autonomous objects, but as entities in a dynamic social-spatial fabric, and as products of a system-approach and of shared knowledge.

Unfortunately, unlike other professions such as medicine and law where precedents are regularly used to build domain knowledge, the building profession treats its knowledge as a commodity, even referring to it as 'intellectual property' [19, 20].

From an academic point of view, environment-related dimensions of human functioning differ from medical aspects, but from the perspective of the individual person, both are integral parts of the homeostatic (self-) regulation of the internal and external environment of the human organism. Design teams, users, care-givers and health science researchers working in close collaboration, present the exciting prospect of such 'social homeostasis' and of resulting enabling products, environments and systems.

### Acknowledgements

The authors would like to thank Roy Davison who provided partial translation and language correction.

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#### **PEER REVIEW**

Not commissioned; externally peer reviewed

#### **CONFLICTS OF INTEREST**

The author(s) declare that they have no competing interests.

#### **AUTHORS' CONTRIBUTIONS**

HF conducted the literature review, did the data collection and composed the article.

EV has been involved in drafting and revising the manuscript.

DDM participated in the supervision of the research reported here.

AH participated in the supervision of the study reported here and in the writing of the article (content and structure).

All authors read and approved the final manuscript.