

# International Encyclopedia of Rehabilitation

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# Universal Design

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The contemporary model of disability explicitly recognizes that both the social and physical environment are factors in the disablement process (see, for example, World Health Organization 2001; Brandt and Pope 1997) and that the process is not a direct causal relationship but, rather, highly probabilistic, i.e. impairment may have different impacts depending on the person, the environment and the resources available. This model recognizes that the social and physical environment is an enabling context that has a great impact on the experience of disability and the process of rehabilitation. It also recognizes that the process of disablement is actually universal and highly variable. Environment, as in the case of any child who has no way of reaching a school, can create limitations on activity and participation, even without the presence of impairment. Furthermore, the impact on two people with the same impairment can be very different, depending on personal factors. For example, a family who can afford private transportation could bring their child to school if there was no accessible public transit, while a family without those means cannot.

Accessible design can be defined as design that does not discriminate against people with disabilities. Universal design, in contrast, is generally defined using the “Mace” definition, originating in the United States, as “the design of products and environments to be usable by all people, to the greatest extent possible, without the need for adaptation or specialized design” (Mace 1985, Mullick & Steinfeld 1997, Ostroff 2001). This definition clearly encompasses accessible design but extends to goals beyond it. But, there are competing ideas and conceptualizations and terms, for example, “Transgenerational Design” (Pirkel 1994), “Design for All” (Aragall 2002) and “Inclusive Design” (Keates and Clarkson 2003). It is important to note that universal design is not a synonym for accessible or barrier free design although many articles and books do use the term in this way. Dion (2006), for example, wrote a book compiling “best practices” in universal design. It focused on solely on comparing accessibility regulations. Yet, the definition above implies a broader agenda that expands on the goals of accessible design to provide benefits for all, not just specific protected classes of people.

There is a growing body of literature exploring the conceptual landscape of universal design and related terms. Bowe (2000) used universal design in reference to practices that make education “more convenient for time-pressed students, more comfortable for people from diverse backgrounds, and more flexible for persons having different learning styles.” This captures the broader scope of universal design and also demonstrates that it can be applied to social interventions like educational practices as well as the physical environment.

Some argue that the concept of universal design lacks a political and social program for change (Imrie 2004). While universal design is often only associated solely with enhancing human performance, in many professional circles, despite the limitations of the definition, the concept implies a more expansive agenda – design for equality, social justice and social inclusion. In the terms of the contemporary social model of disablement, this means goals of “social participation” as well as goals related to functional independence.

“Design for All”, a term mostly used in Europe, is defined as an “intervention in environments, products and services with the aim that everybody, including future generations, and without regard to age, capabilities or cultural origin, can enjoy participating in our societies” (Aragall 2002). This definition captures the lifespan perspective, acknowledges that the concept can be applied to services as well as environments and products, includes an emphasis on conscious intervention for change, explicitly mentions the participation goals, and addresses the fact that there are many reasons why people can be limited in access and use of resources in a society.

It should also be noted, in direct contrast to substituting universal design for accessibility, accessibility has also been re-defined as universal design. A report of a Group of Experts organized by the European Commission defined accessibility as “....providing buildings and places that are designed and managed to be safe, healthy, convenient and enjoyable to use by all members of society..” (Lenarduzzi et al. 2003).

Regardless what definition or term is used, these few examples demonstrate that a new paradigm of design for diversity is replacing the old paradigm of accessibility which focuses on protecting a defined class of people. This new paradigm aligns the goals of people with disabilities with those of many other disadvantaged groups and seeks to create a focus on design for a diverse population in all its variety. The new paradigm expands the legal framework of non-discrimination laws to encompass a broader set of practices. Although originating in design for disability, universal design, as perceived by many, embraces other issues of social justice such as design for differences in gender, age, ethnicity, and socio-economic status. From the perspective of rehabilitation and the new model of disablement this makes sense because it is clear that optimizing abilities and participation requires attention to the whole person, not just a physical, sensory or intellectual characteristic.

Universal design applies to a wide range of built, social and virtual environments. For example, in the built environment, it can be applied to community infrastructure like transportation systems, to public accommodations like stores and offices and places of assembly, and to housing. It can be applied to all types of products ranging from utensils to automobiles, even clothing. It can also be applied to communications and information technologies like computer operating systems and the World Wide Web. It can be applied to business and professional practices like customer service, advertising and education. And, it can be applied at the level of policy like housing or transportation laws and regulations.

Some rehabilitation specialists argue that customized designs and assistive technologies are more effective for people with severe disabilities than off the shelf consumer products can ever be. Universal design puts emphasis on providing facilitators and eliminating barriers to activity and participation. But, there will always be a need for assistive technology and specialized services. Some individuals will need equipment like hearing aids and wheelchairs that augment limitations in the innate abilities of an individual. There will always be some people who cannot be accommodated due to limitations in technology or resources. And still others will need special attention through services like special education because of their severe or unique conditions. Thus, although universal design might reduce the need for assistive technologies and services, it will not eliminate them entirely. Assistive technology and specialized services, in fact, can be viewed as a proving ground for new universal design applications. A good example is speech recognition. This technology found its first significant application in the field of rehabilitation but now it is available widely for all users. Another example is priority parking. Originally developed to reserve parking close to buildings for people with disabilities, new versions are emerging for older people, pregnant women, and even on a fee basis for anyone who desires it. The knowledge amassed from assistive technology development is particularly important in universal design practice. The idea of building in opportunities for customization, in particular, is one that can be practiced on a broad level, particularly with the advent of digitally based production methods.

An important aspect of design for diversity is the role of emotional factors in design. Accessible design focuses solely on function. But, emotional responses to the environment and products are just as important. In fact, there is considerable evidence of a link between usability and emotional response (Norman 2004). A strong positive emotional response can motivate people to learn how to use products more effectively. Consider the adoption of complex consumer electronics. Although they often are very difficult to use, people adopt them and learn how to use them to provide significant emotional benefits, like always being in touch with their children or feeling superior to their peers. Likewise, products that create a negative emotional response are often avoided or abandoned. For example, an individual may avoid building a ramp in front of their home, even though it has significant functional benefits, because they do not want to be perceived by others as having a disability or being frail. Universal design, in fact, seeks to provide the benefits of enabling design without the negative connotation associated with design for disability or aging. If all homes were constructed with one grade level entry, for example, there would be no stigma associated with having an accessible entry.

By producing an environment that is more inclusive, the hope is that the obvious benefits for all will generate a larger constituency to support the provision of increased usability, safety and health in the environment. Universal design proponents argue that the practice of universal design will lead to greater social integration of people with disabilities. A good example is the curb ramp. They were first employed to help people who use wheelchairs gain safe access to community resources. All pedestrians, especially parents pushing prams, bicyclists, and skateboarders, soon learned their benefits. Once these were understood, reactions to the cost of installing them disappeared and now, in some

countries, the ubiquitous presence of curb ramps has opened up significant opportunities for people with disabilities to participate in neighborhood social life, work and entertainment.

There is a perception that some design interventions that reduce barriers for one group of people will be counterproductive to another. For example, the provision of curb ramps may produce a hazard for people who have visual impairments. This can be true, if designed only for wheelchair users, but there are solutions to such problems. Thus, universal design goes beyond the specification of solutions to solve problems of specific groups to holistic solutions that address a broad range of disabilities. For example, curb ramps can be treated with materials and colors that make them detectable to people with visual impairments and augmented by other technologies like audible and visual walk/don't walk signals to make intersections safer for everyone.

It is important to note that the idea that environments facilitate abilities and social participation is not new. But, the priority placed on these goals is different. In a global economy driven by technology, the pace of life is making these design goals more important. The cost of low productivity, inconvenience and errors is simply too high. The aging of the population worldwide is another important driver, especially in the high-income countries that are still the prime market for consumer products.

While these design goals are clearly relevant to high income countries, it is appropriate to ask whether design goals for low and middle-income countries may be different. Shouldn't the first priority be on providing the basic features of accessibility for people who use wheelchairs rather than convenience features for healthy people? In these countries should we worry about the way accessibility features look? If the practitioners of universal design truly seek to address diversity, they have to accept that there will be differences in practices based on economic resources and cultural context. Rather than imposing the same standards everywhere, it may be more appropriate to start with achievable goals and advance the agenda as earlier goals are met. It is also important to note that emotional issues are still important, regardless of the income level of the population. One example is the resistance to providing basic access features due to negative attitudes or misinformation about people with disabilities. Thus, developing codes and standards with the explicit purpose of serving the needs of a broader population may be a more successful approach than mandating wheelchair access alone. This conveys the message that wheelchairs are simply another form of wheeled mobility like bicycles, handcars, baby carriages and other wheeled devices. For example, in low-income rural areas, sidewalks are not common, thus mandating sidewalks and curb ramps solely for people with disabilities is likely to cause a lot of resistance due to their high cost. But safety for all could be improved more easily by widening roadways and marking pedestrian/cycling paths at the side with stones or other low cost markers.

Universal design practices need to address process as well as product. Perhaps the first step in adopting universal design is to develop a means to include minority and disadvantaged groups, including people with disabilities, in planning and design activities to insure that their priorities will be addressed. Indeed, top down approaches driven by

professionals, no matter how well meaning, reinforce social exclusion. Local action committees that have the power to enforce standards are particularly effective in advancing social inclusion because they give power to previously unrepresented groups. Participation like this also demonstrates to other citizens that individuals from marginalized groups have abilities and knowledge to contribute to community life.

Universal design should be viewed as a process leading to ever-higher goals rather than an absolute condition. In fact, the term “universal designing” may be more appropriate (Steinfeld 2007). The universal design philosophy can even be applied to produce a different type of regulatory environment, one that may be more successful in places where resources for implementing them are minimal. For example, some simple, basic accessibility features can be required, but including more extensive universal design practices can be rewarded through incentives. Sometimes, effective incentives can be cost free, for example, fast tracked approvals by municipal or state officials if additional features are included.

The definitions of universal design alone do not provide tools for implementing the concept. To fill these needs, the Center on Universal Design in Raleigh, North Carolina, USA, convened an expert group to develop the *Principles of Universal Design*. In line with the “simple is better” approach, the group concluded that a limited number of basic Principles could be developed so that designers and others would be able to easily understand the implications of practicing universal design. These Principles provide flexibility in how to achieve universal design. Each Principle was also accompanied by a short set of basic design guidelines for implementing the Principle. This document has been disseminated widely including being translated into over twelve languages (Center on Universal Design 2008).

The development of the Principles of Universal Design was an important landmark. They provided a clear operational definition of the concept as well as a useful tool for research and design practice. The simplicity yet comprehensiveness of the seven Principles made them easy to remember and easy to use in a variety of contexts:

**PRINCIPLE ONE:** Equitable Use

The design is useful and marketable to people with diverse abilities.

**PRINCIPLE TWO:** Flexibility in Use

The design accommodates a wide range of individual preferences and abilities.

**PRINCIPLE THREE:** Simple and Intuitive Use

Use of the design is easy to understand, regardless of the user's experience, knowledge, language skills, or current concentration level.

**PRINCIPLE FOUR:** Perceptible Information

The design communicates necessary information effectively to the user, regardless of ambient conditions or the user's sensory abilities.

**PRINCIPLE FIVE: Tolerance for Error**

The design minimizes hazards and the adverse consequences of accidental or unintended actions.

**PRINCIPLE SIX: Low Physical Effort**

The design can be used efficiently and comfortably and with a minimum of fatigue.

**PRINCIPLE SEVEN: Size and Space for Approach and Use**

Appropriate size and space is provided for approach, reach, manipulation, and use regardless of user's body size, posture, or mobility.

The Principles present a framework for practice and a foundation for further developments in this field. Nevertheless, the concept of universal design, as currently conceived, is not perfect. There are, as described above, competing definitions and even terms. Limitations of the Principles have been identified as well. These include concerns about language and clarity, difficulty in translation, lack of measurable guidelines, lack of an explicit evidence base, lack of a focus on affordability, and lack of an explicit mention of an aesthetic component (Steinfeld 2006). It is likely that, in the years to come, these criticisms will be addressed by activities currently underway in the universal design community. Meanwhile, they provide a good tool to use in applying the concept in a wide range of domains.

## References

- Aragall F. 2002. Why design for all? Retrieved on 1-25-08 from <http://www.design-for-all.org/>.
- Bowe F. 2000. Universal Design in Education. Westport, CT: Bergin and Garvey.
- Brandt Jr EN, Pope AM (Eds.). 1997. Enabling America: Assessing the role of rehabilitation science and engineering. Washington, DC: National Academy Press.
- The Center for Universal Design. 1997. The principles of universal design (version 2.0). Raleigh, NC: NC State University, The Center for Universal Design. Retrieved on 2-6-08 from [http://www.design.ncsu.edu/cud/about\\_ud/udnonenglishprinciples.html](http://www.design.ncsu.edu/cud/about_ud/udnonenglishprinciples.html).
- Dion B. 2002 International Best Practices in Universal Design: A Global Review. Ottawa: Global Alliance on Accessible Technologies and Environments.
- Imrie R. 2003. The impact of Part M on the design of new housing. London: Department of Geography, Royal Holloway University of London, Egham, Surrey.
- Keates S, Clarkson J. 2003. Countering design exclusion: An introduction to inclusive design. New York: Springer.

- Lenarduzzi D (Group Chairperson). 2003. 2010: A Europe Accessible for All. European Commission. Retrieved on 2-6-08 from [http://www.socialdialogue.net/en/en\\_lib\\_si\\_170.jsp](http://www.socialdialogue.net/en/en_lib_si_170.jsp)
- Mace R. 1985. Universal design, barrier free environments for everyone. Los Angeles: Designers West. (see also Center for Universal Design, 1997).
- Mullick A, Steinfeld E. 1997. Universal design: What it is and isn't. Innovation, Spring, 14-18.
- Norman DA. 2004. Emotional Design. New York: Basic Books.
- Ostroff E. 2001. Universal design: the new paradigm. In Ostroff E, Preiser W (Eds.). Universal design handbook. New York: McGraw Hill.
- Pirkl JJ. 1994. Transgenerational design: Products for an aging population. New York: John Wiley & Sons.
- Steinfeld E. 2007. International symposium on housing for aging in place. The 2nd International Conference on Technology and Aging (ICTA), Festival of International Conferences on Caring, Disability, Aging and Technology. Toronto, Ontario, June 18, 2007.
- Steinfeld E. 2006. Position paper: The future of universal design. Buffalo, NY: IDEA Center.
- World Health Organization. 2001. Introduction. International Classification of Function. Retrieved on 6-20-07 from <http://www3.who.int/icf/intros/ICF-Eng-Intro.pdf>.