

UNIVERSAL DESIGN: FROM POLICY TO ASSESSMENT RESEARCH AND PRACTICE

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Abstract

The ultimate purpose of this article is to delineate a much needed research agenda for the development of universal design performance assessments. A professional definition of universal design is given, and a conceptual framework for universal design evaluations is outlined. The history of universal design research and practice is chronicled, and examples of critical research issues are cited. Some cultural, legislative and professional issues are presented, including relevant disciplines and subfields of universal design. Select worldwide practices, publications and current events are listed. Finally, as the basis for the creation of a universal design research agenda major issues and needed assessment methodologies are highlighted.

Keywords:

Universal design; policy; professional practice; performance assessment; research methodology.

Introduction: Universal Design Assessments - Professional Definition and Theories

A common definition for universal design can be found in the Universal Design Handbook (Preiser and Ostroff, 2001). Universal design attempts to make products, equipment, building interiors and exteriors, transportation systems, urban areas, as well as information technology, accessible to and usable by all without regard to gender, ethnicity, health or disability, or other factors that may be pertinent. While a comprehensive theory on universal design does not yet exist, different theoretical points of view are contained in the Universal Design Handbook section on "Premises and Perspectives in Universal Design." For example, there are chapters on "An Integrated Approach to Universal Design: Toward the Inclusion of All Ages, Cultures and Diversity" (Sandhu, 2001), or "Designing Our Future Selves." (Coleman, 2001).

It can be said that the origins of universal design go back to the period after World War II when hundreds of thousands of veterans returned

from the war and required rehabilitation and education in order to resume their normal lives. For those who were wounded in action, this resulted in the beginning of the movement, which led to the early establishment of rehabilitation centers at universities, for instance, at the University of Illinois. It was then when campuses of universities were first made accessible for wheelchair users and people with other disabilities. Eventually, these efforts resulted in a movement called Barrier-Free Design, and the development of accessibility guidelines on a state-by-state basis. They, in turn, formed the foundation for what are now the ADAAG, i.e., the guidelines for the implementation of the Americans with Disabilities Act (ADA, 1990).

From the outset of this article and discussion, it should be noted that universal design transcends the ADA in many significant ways, in that it goes beyond minimum dimensional and other requirements of the built environment, and is pertinent to the entire life space of populations. During its short gestation period, since about 1985, universal design has established itself as a potent factor in improving the quality of life for everybody, and on a global basis. In other words, universal design is not just for those who can afford it, or the industrialized countries, but it is also making inroads in developing countries, such as India (Balaram, 2001). Universal design has been called the "Design Paradigm of the 21st Century" (Ostroff, 2001; Preiser, 2006), which amounts to a laudable vision, but appears not to have been achieved by any means, and certainly not on a global basis. Some of the most advanced countries in regards to universal design are Japan, the United States and Canada, and certain countries in the European Union. In fact, Norway is considered

to be most advanced in implementing universal design education and policies in community planning in that country (Christophersen, 2002; Vavik, 2008).

The United States Federal Government has had a sustained effort in creating research centers through the National Institute of Disability Rehabilitation Research (NIDRR) and its funding mechanisms. These centers have focused on topics ranging from housing to transportation, from wheelchair design to information technology, and the media, to name just a few (IDEA Center, 2007). Only one of these centers had been tasked with developing assessment methodologies (NC State Center for Universal Design, in collaboration with Jon Sanford at the Atlanta VAMC) over the past 10 years. Sanford (2007) stated, "To my knowledge, no one is working on this (effort). The closest would be (Edward) Steinfeld, who is reworking the UD Principles, and is doing a crosswalk to the ICF. Personally, my problem with the assessment based on the UD Principles is that they are not validated in the first place. I always argued that instead of using the Principles to determine if a design is universal, we should use the design to determine if the Principles are valid." In other words, due to discontinuation of funding support, only limited results in terms of applying and assessing evaluation instruments have been produced so far. The only other effort in this regard known to the author was undertaken in Belo Horizonte, Brazil. An attempt was made by Guimaraes (2001) to develop rating scales for the assessment of universal design, based on his dissertation research at the Center for Universal Design at North Carolina State University.

A conceptual framework for universal design

evaluation was outlined by the author (Preiser, 2001) in the Universal Design Handbook. It represented an extrapolation from the building performance evaluation framework first developed and presented in Time-Saver Standards: Architectural Design Data (Preiser and Schramm, 1997), and was based in part on the author's post-occupancy evaluation projects of medical facilities and workshops for clients like Duke Medical Center, Kaiser-Permanente, and the Department of Veterans Affairs.

History of Research and Practice

Just like the field of universal design itself, its history of research and practice is rather short and consists primarily of case study evaluations of built projects or developed products, as well as use of expert judgments and direct, verbal user feedback. Due to the lack of a systematic and comprehensive toolkit of evaluation methodologies, the case studies use primarily field-based evidence, which is often anecdotal and observational in nature. For example, in a three-day post-occupancy evaluation workshop at Kaiser-Permanente's medical office building in Mission Viejo, California (Preiser, 1996), a number of issues surfaced which the designers of the facility should not have overlooked (see Box 1).

Overall, with the medical office building being located next to Leisureland, a planned community intended primarily for elderly persons, the planners/designers had overlooked the physical and psychological needs of that segment of the population.

- Parking for people with disabilities was too far from the main entrance.
- Patients waiting for transportation had no protective shelter shielding them from the elements at curbside.
- The main entrance had two confusing entry doors, kitty corner from each other, thus causing enormous wind drafts in inclement weather.
- The visual building directory lacked clarity as to how to get to the various departments/treatment areas. Its lettering was too small for persons with vision problems, and it had uncomfortable glare, reflecting a skylight located overhead.
- There was only one elevator, thus making the second storey inaccessible for people with disabilities in wheelchairs when the elevator was out of order.
- The patient waiting area was arranged in such a way that it did not permit eye contact between waiting patients and the staff behind the registration counter, thus causing unnecessary psychological discomfort.
- The counter and low window for transactions by persons in wheelchairs was blocked by a credit card machine, thus making it unusable.
- There was no play area for patients with accompanying children.
- There was no provision for additional seating during seasonal overflow of patients; e.g., during the flu season.
- The unisex toilets, while accommodating male, female and disabled patients in wheelchairs, became a bottleneck on multiple occasions.

Box 1: Issues in Universal Design Performance of a Medical Office Building. (Source: Author).

Assessment Methods

As indicated above, no comprehensive toolkit for assessing universal design exists to this date. Evaluations or assessments link evaluation methods with the appropriate criteria according to which a product or design is judged. Traditionally, such criteria existed in codified format, such as building codes, life safety codes, American National Standards Institute (ANSI) standards, Time-Saver Standards, as well as agency-specific standards and guidelines, which have evolved over time. In

some cases, and due to intellectual property protection, such standards are not accessible to the public. They are guarded heavily by user agencies, such as the military, chip making corporations like Intel, or global consumer goods manufacturers, such as Procter & Gamble. Since universal design primarily addresses the human dimension of designed products and environments, it makes sense to create an evaluation framework according to the scale of the item being evaluated (see Table 1).

Scale of UD Item	Examples of UD Features	Assessment Methods	Assessment Measures
Fiskars scissors	Left-handed use	Time/motion study	Ease of manipulation/ cutting speed
Appliances; e.g., washer/dryer	Left or right mounts	Observation Time/motion study Verbal feedback	Ease of use
Interior Architecture	Hard floors	Time/motion study Observation	Abrasion Ease of movement
Buildings	Wayfinding system	Tracking of building users	Ease of orientation/ speed of wayfinding
Urban environment	Mixed-use vertical integration	Transportation hub method Time-lapse video/ observation/still photography	Ease of movement Different conditions of crowding
Information technology	Global access to services via the Internet	User feedback Questionnaire survey	Satisfaction Speed of access Efficiency of services

Table 1: Universal Design Assessment Framework (Source: Author).

For example, the “Mr. Good Grips” line of kitchen utensils by OXO has been tested, first in the laboratory and then in thousands of kitchens. Feedback on their performance can be obtained using consumer suggestions and focus groups. Similarly, at the scale of an automobile, the Japanese have made the most progress when it comes to universal design features. These can include ramps which allow a wheelchair user to roll directly into the back of a van, or a driver’s seat which swivels and allows the driver to enter and exit the vehicle easier, especially when he or she has limited use of the legs.

The above framework serves to illustrate the pervasive nature of universal design as it reaches into virtually every aspect of our life space: at home, at work or during travel to near and distant destinations. Field based research using real world settings and actual users of UD items and features will generate the basis for knowledge building in universal design performance. A case in point is the controversy surrounding the use of segways by disabled people in indoor public spaces (Watters, 2007a and b).

At this time the only guideposts for universal design assessments are the so-called Seven Principles of Universal Design (Story, 2001). The Principles (see Box 2) were created by the Center of Universal Design at North Carolina State University, and its consultants from throughout the United States.

The Principles constitute lofty ideals, accompanied by subsets of guidelines and design recommendations, which are rather general in nature and not quantified at all. Thus, they are helpful in pointing the designer into the right direction, but not adequate to let him or

her know what to do in a specific situation.

1. Equitable use – the design is useful and marketable to people with diverse abilities.
2. Flexibility in use – the design accommodates a wide range of individual preferences and abilities.
3. Simple and intuitive use – use of the design is easy to understand, regardless of the user’s experience, knowledge, language skills, or concentration level.
4. Perceptible information – the design communicates necessary information effectively to the user, regardless of ambient conditions or of the user’s sensory abilities.
5. Tolerance of error – the design minimizes hazards and adverse consequences of accidental or unintended actions.
6. Low physical effort – the design can be used efficiently and comfortably and with minimal fatigue.
7. Size and space for approach and use – appropriate size and space are provided for approach, reach, manipulation and use, regardless of user’s size, posture, or mobility.

Box 2: The Seven Principles of Universal Design. (Source: Author).

The challenge is to operationalize the Seven Principles and to align them with the type of performance criteria standards and guidelines which designers and planners are accustomed to. For example, fire codes clearly spell out the maximum distance from an occupied space to the legal fire egress location. In staying with

this example, various factors play a role in the establishment of such criteria, such as type of occupancy, construction type, space sizes, and general layout considerations (e.g., open vs. closed/compartmentalized spaces), not to mention any hazardous conditions, such as seismic or biohazards. In summary, the still-emerging field of universal design has a long way to go before it can consider itself established, as far as building performance criteria and assessments are concerned.

Examples of Critical Research Issues

Universal design clearly relates to the basic human senses and spatial behavior (see Table 2).

It is the intent of universal design to provide all people with as much of an experiential richness as possible. Thus, ambience with appropriate

sights, sounds and smells is a relevant concern. Furthermore, this means the aesthetic dimension of products and places is also very important, as is basic health, safety and security, functionality and efficiency.

Over the years, human factors engineering research has produced invaluable knowledge and performance data on human senses and perception, especially when it comes to military equipment, airplanes, etc. Harvesting the lessons learned in this research would be a priority in a future research agenda on universal design assessments.

An example of how multiple sensory modes can play a pivotal role in the functioning of students/patients is the Jerusalem Center for Multi-Handicapped Blind Children (Preiser, 2006a). While the official name of that Center would

Sensory Mode	UD Implications	UD Examples
Vision/Sight	A majority of information about the environment is communicated through vision	Tactile and auditory guidance devices. Display modes Maps, computer displays Audiotapes, etc.
Audio/Hearing	Emergency alarms in hotels and other facilities	Visual displays Strobe lights, warning signs Airplane guidance systems pointing passengers to exits
Olfactory/Smell	Imperceptible carbon dioxide	Sound alarm systems
Tactile/Touch	Surface characteristics	Tactile maps and rubber tiles in pavement
Gustatory/Taste	Food safety	Food warning labels
Radiation	Health hazard	Warning signs and devices

Table 2: Universal Design and Human Senses (Source: Author).
Disabilities can pertain to one or more of these senses, sometimes in the same person.

be considered politically incorrect in the United States today (“persons with disabilities” instead of “handicapped” is the preferred terminology), it is nevertheless considered to be a role model for how to treat children in that very complex situation. The Center, sponsored by the Keren-Or (Ray of Light) Foundation in New York City, has a unique approach of highly individualized therapies for the various children, who can range from two months to 18 years of age. The same child may have several disabilities in addition to being autistic, for example. Most of the children (40) are permanent residents in the facility, while the rest (about 20) are brought to the Center by their parents every morning, and are then picked up at the end of the day.

Political determinants weighed heavily in the site selection. The site, adjacent to a future city park in the suburb of Ramot, Jerusalem, is very steep and definitely not ideal. It means that the children, many of whom cannot walk by themselves, have to be transported by the elevator from the top residential floor, down to the ground floor where the playground is situated. As the author discovered in European centers for this type of population, the so-called “cottage concept” would have been much better, whereby a counselor lives with five to seven patients in an apartment-like setting on a single level, thus permitting direct access to the outside. The case study referred to above and the planning and design guidelines which resulted from it are being articulated for another paper to be published this year.

As with many special populations, there is a paucity of research literature on how to design for persons with visual impairments. Thus, universal design assessments are the next best

solution to guide the designer.

Another critical dimension in universal design is human spatial behavior, with its universal design implications (see Table 3). It is clearly part of the human evolution and must not be ignored. Moreover, it has definite cultural relativity and dimensions.

Spatial UD Concept	Human Behavior Concept In Universal Design
1. Territorial Space	Dominance Hierarchy; Status Expansion
2. Personal Space	Privacy; Maintenance of Integrity of Individuals
3. Space Boundaries	Territorial Defense; Social Order; Security
4. Proxemic Space	Communication; Access to Valued Resources
5. Spatial Density	Crowding; Distribution of Resources
6. Spatial Scale	Functionality in Relationship to Task; Anonymity; e.g., in high rises
7. Sociofugal vs. Sociopetal Space	Control; Dispersion or Attraction/ Concentration of People

Table 3: Universal Design and Human Spatial Behavior. (Source: Author).

For example, the concept of privacy means different things in the Western culture, in Japan or in the Navajo Indian culture, at least in their traditional ways. While in the Western culture privacy means physical separation, both visually

and in the auditory sense, in the traditional Japanese culture the auditory separation did not take place. Paper screens did not exactly provide too much visual privacy either. Then, in the Navajo culture and their traditional dwelling, the Hogan, no privacy in the Western sense exists, since it is one space with no partitions, and everything that goes on can be heard, seen and smelled.

There is a general lack of understanding of how processes like way finding occur, not just for persons with disabilities, but for all users of a facility like Children's Hospital in Cincinnati. It features a signage system which Robert Probst developed using color coding.

In considering a modern day situation, such as density and crowding in offices, the space standards for Japanese offices provide for about 65 square feet per worker; i.e., half of the Western standard. Similarly, standards among Western countries pertaining to lighting, for example, vary considerably for the same situations and tasks. Thinking about thermal standards, people in the United States are used to overheating and overcooling spaces, depending on the season, while in some Scandinavian countries people just dress to the occasion.

Some Cultural, Legislative and Professional Issues

Cultural differences in which people with disabilities are viewed differently in different cultures and parts of the world (Balaram 2001), and even sub-groups within the United States. Another example is the concept of "Visitability", which connotes the ability for a person with disabilities to enter a place, but not necessarily

to live in it (Nasar & Evans-Cowley, 2007).

Unfortunately, acceptance of universal design concepts in the design and building professions is progressing only slowly. The new magazine *Ultimate Home Design* is an attempt to bridge the gap between universal design and the building professions by presenting built examples of new and remodeled existing homes that integrate universal design features from the outset (Preiser 2006b). Furthermore, the perception of added costs of universal design features needs to be eliminated through good exemplars and tested prototypes.

Due to the lack of operational performance criteria, codification of universal design assessments has not progressed enough, as was noted elsewhere in this article. Ideally, UD assessments should relate to regulatory devices like building codes, and they should transcend the minimum requirements of the ADA.

There are ethical dilemmas and potential conflicts of interest and litigation in cases where universal design and its potential are not achieved, for example, in senior living communities. Segways (Watters, 2007a & b) can aid disabled persons in navigating through neighborhoods, shopping centers, and establishments like Barnes & Noble bookstores, but they can also create controversy in the business world for safety reasons and fear of litigation.

Some tourist destinations and cruise lines improve accessibility for disabled persons (Creager, 2007); for example: The Rocky Mountaineer Railtour from Vancouver, BC, to Calgary, Alberta, provides spectacular vistas of the Canadian Rockies. It features an elevator to lift wheelchair users to the top level of rail cars; near Newport,

OR, at Yaquina Head Outstanding Natural Area, wheelchair users can roll on paths around the tide pools at low tide; or, at Fantastic Caverns near Springfield, MO, a tram “follows an ancient riverbed and gives visitors a great look at some of the magnificent stalactite and stalagmite formations” (Harrington, 2007).

Relevant Disciplines and Subfields

A great number of disciplines are affected by universal design and its implications. These range from planners and designers to facility managers and groups that utilize facilities, especially in the health field, rehabilitation, as well as groups dealing with all sorts of disabilities. Therapists and people studying human behavior and interactions are involved, and so are administrators/managers of communities and facilities that cater to seniors. Disciplines, which are relevant to UD, are listed in Table 4.

Then there is the building industry, especially housing, which is beginning to take note of universal design by creating and building prototypes of universally designed houses, such as the Lifewise Home built by the National Association of Home Builders (NAHB) (2002) near Washington, DC, and a similar demonstration home by the IDEA Center by the University at Buffalo. The question arises whether assessments of these universally designed homes have been done in a thorough manner, if at all, and whether the lessons learned have been or will be applied to future generations of such homes.

Discipline	Examples of Universal Design Applications
Industrial Design	See 3 sub-fields below
Product Design	Utensils, tools, furniture, equipment
Graphic Design	Directories and guidance systems
Fashion Design	Clothing for various disabilities
Interior Design	Accessible design of dwellings, offices and other spaces and places
Architecture	Equal access and circulation for all user groups and levels of disabilities
Urban Design and Planning	Accessible design of transportation facilities, university campuses and communities in general
Information Technology	Access to services and Internet commerce
Health Facility Planners	Accessible hospital, rehabilitation and care facilities
Administrators	Enlightened governance regarding accessibility in organizations
Facility Managers	Operation and maintenance in line with accessibility requirements
Environmental Psychologists	Research in support of constituencies with disabilities

Table 4: Universal Design- Relevant Disciplines. (Source: Author).

Information technology is a particularly fertile ground for exploring universal design concepts. Just consider how the VISA card, perhaps the most universal of all universal designs, has

revolutionized the business world by permitting customers to carry out transactions in several hundred countries with different banking systems and currencies. The VISA card provides true universal access to merchants and services on a global basis (Hock, 2005).

In Europe, a number of social and other services (Sandhu & Leibert, 2001) have been experimented with through on-line access, thus permitting anybody, and not just the disabled, to do business and transactions from their home computer, instead of having to travel to various locations in their cities, thus wasting time and energy. With the Internet, even the remotest spot on Earth can access services that are provided that way. It is clearly a revolution, the end of which we have not seen yet.

Select Worldwide Universal Design Practices, Publications and Events

The following vignettes by no means convey a complete picture of UD efforts in the countries that are listed.

- Japan – there is widespread acceptance of universal design as a way of enhancing the usability of products, transportation and built environments. It is also pertinent to a growing sector of the aging society, and thus, an important part of the economy. The second International Congress of and Expo on Universal Design (IAUD 2007) info@iaud.net was held in Kyoto in October of 2006. It drew over 13,000 registrants and major industries were represented, such as automotive, computer and product design. The proceedings were edited by Satoshi Kose (2007).
- Norway – In this forward-looking country, oil

money is being invested for the future, and there is not only a great concern for preserving the quality of the environment, but also for making cities, buildings and parks universally accessible (Asmervik, 2002). In fact, curricula in all design and planning schools must teach universal design, and community planners use universal design as their guiding principle. Already mentioned above was the book edited by Jon Christophersen (2002). A new compendium entitled Inclusive Buildings, Products and Services: Challenges in Universal Design is being edited by Tom Vavik (2008), and is expected to be released later this year.

- Germany – The “Internationales Design Zentrum” (IDZ) www.idz.de in Berlin is presently creating an exhibit on universal design, to be opened in November of this year. In 2009 and 2010 it is scheduled to travel to conferences, expos and design centers around Europe.
- France – A much acclaimed handbook by Louis-Pierre Grosbois (2007), Handicap et Construction, appeared in its seventh edition last year. It addresses accessibility of public buildings, housing developments and freestanding homes, historic places, transportation facilities, as well as urban design.
- Ireland – The National Disability Authority nda@nda.ie [Agency’s] established a new Center for Excellence in Universal Design is the lead state agency on disability issues, providing independent expert advice to Government on policy and practice. It sponsored a conference with international participation in October of 2007, and it offers an “Excellence Through Accessibility Award”.
- Belgium – Two publications of note are:

Froyen, H., Asaert, C., Dujardin, M. and Herssens, J. (2006) *Ontwerpen for iedereen, integraal en inclusief* (Universal Design Kit). Brussel: Ministerie van de Vlaamse Gemeenschap, Gelijke Kansen in Vlanderen. The second one is: Devlieger, P., Renders, F., Froyen, H., and Wildiers, K. (2006). *Blindness and the Multi-Sensorial City*. Antwerpen/Apeldoorn: Garant.

- Canada – in September of 2008, the International Federation on Aging (IFA) is holding its 9th Global Conference called “Aging Design Montreal” , which is accompanied by an Expo info@vdm-adm.ca.

- Brazil – Several international congresses on universal design have been held in recent years, with presentations from throughout the world. Educational programs at the university level are expanding, theses are being written (e.g., on changing codes to make urban housing more accessible as the population ages) and attempts at developing universal design assessment tools have been made (Guimaraes, 2001). Recently, a book was published on techniques for architects and urbanists to incorporate universal design into real world projects (Cambiaghi, 2007). Presently, at the University of Sao Paulo, a new edited book is in preparation entitled *Universal Design: Pathways to Accessibility In Brazil* (Prado, Lopes and Ornstein 2009).

- United Kingdom – The Royal College of Art hhc@rca.ac.uk in London sponsors bi-annual ‘INCLUDE’ conferences with participants from around the globe. The next conference is scheduled for April 5-9, 2009.

- Italy – The International Council for Building Research and Innovation (CIB), Working Commission W 084, is headquartered in Rome

www.roma.itc.it. Together with Georgia Institute of Technology and the National Research Council, Italy (CNR), it organized this year’s meeting on “Building Comfortable and Livable Environments for All” in Atlanta, GA on May 15-16, 2008.

- United States – a global online electronic newsletter is edited by Elaine Ostroff, Director, Global Universal Design Educator’s Network. It can be accessed at <http://www.universaldesign.net>. The IDEA Center, University at Buffalo can be considered the best research center focusing on universal design, with many and often multi-disciplinary research initiatives. Their very informative E-Newsletter can be accessed at this address: <http://www.ap.buffalo.edu/idea/e-Newsletter/index.htm>. The Eighth Annual Conference on ‘Multiple Perspectives on Access, Inclusion & Disability: Looking Back & Thinking Ahead’ was held at The Ohio State University (ADA-OSU@osu.edu) in April of 2008. Last year’s conference proceedings are included in the references (Nasar and Evans-Crowley 2007). A bi-annual event, the International Conference on Universal Design is organized by Adaptive Environments in Boston www.adaptiveenvironments.org at venues both inside and outside the United States. In May of this year, the American Institute of Architects celebrates its 150th birthday with a publication *Architecture: Celebrating the Past, Designing the Future @* <http://www.aia.org/bookstore>. By including a sidebar on universal design in the book, the profession of architecture takes notice of this evolving field and area of concern. Of great importance is the recently created Global Universal Design Commission (GUDC) recud-enewsletter-list@listserv.buffalo.edu , which has the purpose

of promoting universal design. One of the first initiatives will be the development of voluntary design standards. Lighthouse International, which primarily serves the visually impaired, publishes a web based monthly newsletter called "At-A-Glance". The reader can find more information at lighthouse@webletter.lighthouse.org. Interestingly, the just appointed Governor of New York State, David A. Paterson, has been legally blind since boyhood.

Major Issues and Needed Assessment Methods - Creating a Research Agenda

The goals of creating a universal design assessment research agenda are two-fold: (1) To collaborate with colleagues in the emerging field of universal design (called 'design for all' in Europe), in an effort to create a research agenda which will advance it to the next level of pragmatic application in the real world; and, (2) More specifically, this means developing a toolkit of methodologies (for a basic overview, see Table 5).

It is hoped that this will allow universal design solutions to be evaluated in a systematic manner; and further, the creation of performance criteria which relate to regulatory mechanisms such as zoning and health and safety codes; functional requirements, as documented in design guides for different building and space types; and, psychological and cultural needs of the users of universal design.

To reiterate, the approach to be taken sees universal design defined as making products, spaces and buildings, urban infrastructure, as well as information technology accessible to and usable by (almost) all people. Significant

strides have been made in Europe, the United States and Japan in creating and developing this field, which, in its true spirit, aims to transcend government issued minimum standards, such as the ADAAG guidelines which have emanated from The Americans with Disabilities Act (ADA).

Going back to the 1970s, the author has had a longstanding commitment to and experience in universal design research, consulting, lecturing and scholarly works. For example, in February 2007, he was contacted by Hubert Froyen, member of a Belgian research consortium, which published the book, and CD on *Ontwerpen voor iedereen – Integraal & Inclusief* (Asaert, Dujardin & Herssens, 2006), intended to increase public awareness about universal design in Belgium. An exchange of universal design research ideas and priorities ensued. This, in turn, resulted in the consideration of further collaboration in the future.

The following are outcomes/elements of the expected development of a research agenda for universal design assessments:

- Conceptual basis for UD evaluation process, using excerpts from the Universal Design Handbook (Preiser, 2001; chapter 9).
- Outline of tasks, time-line, deliverables and literature review.
- On-site activities could include:

- 1) Workshop to raise public awareness of UD, also with professional associations;
- 2) Lecture presentation(s) and Colloquia with students;
- 3) Research focus groups with representatives of the disability community;
- 4) Site visits of exemplary UD solutions, select UD evaluation case studies;
- 5) Carry out UD case study evaluations;

6) Liaison with relevant organizations; e.g., the International Association for Universal Design (IAUD) in Yokohama, Japan; the CIB Committee W064 in Rome, Italy; the Design for All Foundation in Barcelona, Spain; the bi-annual INCLUDE conferences organized by the Royal College of Art in London, UK; and,

the Designing for the 21st Century conferences held jointly by the Center for Universal Design at North Carolina State University in Raleigh and Adaptive Environments, Inc. in Boston.

Overview of Data Gathering Methods and Measures	
1. Behavioral Observations	Behavior Inventory and Taxonomy
2. Mechanical Recordings	Occupant and Environment Patterns
3. Visual Recordings	Occupant and Environment Change
4. Physical Measurements	Physical Measures
5. Verbal Response Measurement	Perceived Performance Measures
6. Expert Judgment	Point Ratings
Data Gathering Methods and Measures	
1. Behavioral Observations	Behavior Inventory and Taxonomy
Direct Observation	- Behavioral Identification/Classification - Behavioral Mapping - Occupant Tracing
Participant Observation	- Interaction Patterns/Dynamics - Social Dynamics - Utilization of Resources
2. Mechanical Recordings	Occupant and Environment Patterns
- Counting - Event Recording - Light Sensor Gate/Contact Switch Plates - Location Mapping	- Frequency of Events - Space Use - Location of Occupants - Use of Preferred Spaces/Resources
3. Visual Recordings	Occupant and Environment Change
Still Photography	- Space Inventory - Archival Records/Photo Annotation - Ambient Environment Quality (Color, Light)
Video Recording	- Macro and Micro Behavior - Occupant Movement - Conflict Identification

Continue

Time-Lapse Photography	- Behavior Sequences - Occupant Speed/Tracking - Individual vs. Group Interaction
5. Verbal Response Measurement	Perceived Performance Measures
Occupant Interviews	- Generic/Open-Ended Questions - Forced Choice Questions
Occupant Surveys	- Numeric Ratings - Generic/Open-Ended Questions - Forced Choice Questions
Expert Judgments	- Esthetic Quality Comparisons - Point Rating Systems
6. Physical Measurements	Physical Measures
- Gauge - Chemical Test Kit - Scale - Light Meter - Sound Meter - Inclino-Meter	- Temperature - Humidity - Air Velocity - Light - Chemical Agents - Abrasion - Elasticity - Live-loads - Decibels - Light Levels

Table 5: An Overview of Data Gathering Methods and Measures. (Source: Author).

Summary

This article is conceptual in nature and intended to point to future directions in universal design assessment. Before universal design will enter the mainstream of society and be embraced by the planning, design and building professions, its basic underlying philosophy needs to be understood and accepted. Following the democratic principle of equality, it will be important for these professions to make a serious commitment to making products and the built environment accessible to and usable by all. This is particularly important in a period of demographic change to where a significant segment of the population tends to live much longer, and thus, will require a complete range of

services and support systems. Such support used to be provided by the nuclear and extended family. However, with greater job mobility, such support is no longer available and families are spread over wide geographic areas. This article has attempted to demonstrate the viability of universal design, as well as its relevance to many aspects of people's life space.

Assessing universal design performance is critical and needs to be developed in due course. Some examples of assessment methods and measures were given, and some cases where universal design has made significant progress were cited. This is particularly true in the residential sector, at the scale of individual dwellings, in the design of higher-density developments

with pedestrian access to amenities, as well as multi-modal transportation hubs, an example of which are the Japan Rail Towers at Nagoya Station in Japan.

References

- Americans with Disabilities Act (1990). Access Board Washington, DC, Available online. <<http://www.access-board.gov/ada-aba/index.htm>>
- Asaert, C., Dujardin, M. & Herssens, J. (2006). Ontwerpen Voor Iedereen- Integraal en Inclusief (Universal Design Toolkit), Ministeriet van de Vlaamse Gemeenschap, Gelijke Kansen in Vlaanderen, Brussels, Belgium.
- Asmervik, S. (2002). Cities, Buildings and Parks for Everyone: A Universal Design Compendium. In J. Christophersen (ed.), *Universal Design: 17 Ways of Thinking and Teaching*, Husbanken, Oslo, Norway.
- Balaram, S. (2001). Universal Design and the Majority World, In W.F.E. Preiser and E. Ostroff (eds.), *Universal Design Handbook*, McGraw-Hill, New York, USA.
- Christophersen, J. (ed.) (2001). *Universal Design: 17 Ways of Thinking and Teaching*, Husbanken, Oslo, Norway.
- Cambiaghi, S. (2007). *Desenho Universal; Metodos Tecnicas Para Arquitectos E Urbanistas*, Senac e Livraria Cultura, Sao Paulo, Brazil.
- Coleman, R. (2001). *Designing Our Future Selves*, In W.F.E. Preiser & E. Ostroff (eds.), *Universal Design Handbook*, McGraw-Hill, New York, USA.
- Craeger, E. (2007). *Some Tourist Destinations Improve Accessibility for Disabled*, Arizona Republic, December 2.
- Devlieger, P., Renders, F., Froyen, H., and Wildiers, K. (2006). *Blindness and the Multi-Sensorial City*, Garant, Antwerpen/Apeldoorn, Belgium.
- Grosbois, L.P. (2007). *Handicap et Construction*, 7th edition, Editions Le Moniteur, Paris, France.
- Guimaraes, M.P. (2001). *Universal Design Evaluation in Brazil: Development of Rating Scales*, In W.F.E. Preiser & E. Ostroff (eds.), *Universal Design Handbook*, McGraw-Hill, New York, USA.
- Harrington, C.B. (2008) *101 Accessible Vacations: Travel Ideas for Wheelers and Slow Walkers*. London, Demos.
- Hock, D. (2005). *One from Many: VISA and the Rise of Chaordic Organization*, Berrett-Koehler Publishers, Inc, San Francisco, CA, USA.
- IDEA Center (2007). *IDEA Center Receives New Contract from U.S. Access Board*, J. Maisel (ed.), IDEA Center e-newsletter, Center for Inclusive Design and Environmental Access, University of Buffalo, NY, USA.
- Kose, S. (ed.) (2007). *Proceedings of the 2nd International Conference for Universal Design in Kyoto 2006*, International Association for Universal Design, Yokohama, Japan.
- Nasar, J.L. & Evans-Cowley, J.(eds.) (2007). *Universal Design and Visitability: From Accessibility to Zoning*, The John Glenn School of Public Affairs, Columbus, OH, USA.
- National Association of Home Builders - NAHB (2002). *The LifeWise Home*, NAHV Research Center, Bowie, MD, USA.
- Ostroff, E. (2001). *Universal Design: The New Paradigm*, In W.F.E. Preiser & E. Ostroff (eds.), *Universal Design Handbook*, McGraw-Hill, New York, USA.
- Preiser, W.F.E. (1996). *Kaiser Permanente POE Workshop*, In G. Baird et al., *Building Evaluation Techniques*, McGraw-Hill, New York, USA.
- Preiser, W.F.E. & Schramm, U. (1997). *Building Performance Evaluation*, In D. Watson et al (eds.), *Time-Saver Standards: Architectural Design Data*, McGraw-Hill, New York, USA.
- Preiser, W.F.E. & Ostroff, E. (eds.) (2001). *Universal*

Design Handbook, McGraw-Hill, New York, USA.

Preiser, W.F.E. (2001). Toward Universal Design Evaluation, In W.F.E. Preiser & E. Ostroff (eds.), Universal Design Handbook, McGraw-Hill, New York, USA.

Preiser, W.F.E. (2003). Improving Building Performance, NCARB, Washington, DC, USA.

Preiser, W.F.E. (2006a). The Jerusalem Center for Multi-Handicapped Visually Impaired Children, In J. Zeisel, Inquiry by Design, 2nd edition, W.W. Norton & Company, New York, USA.

Preiser, W.F.E. (2006b). Universal Design: Paradigm for the 21st Century, Ultimate Home Design, Vol. 1 (1), January/February.

Sandhu, J. (2001). An Integrated Approach to Universal Design: Toward the Inclusion of All Ages, Cultures and Diversity, In W.F.W. Preiser & E. Ostroff (eds.), Universal Design Handbook, McGraw-Hill, New York, USA.

Sandhu, J. & Leibert, A. (2001). User-Centered Deployment and Integration of Smart Card Technology: The DISTINCT Project, In W.F.E. Preiser & E. Ostroff (eds.), Universal Design Handbook, McGraw-Hill, New York, USA.

Sanford, J. (2007), Personal Communication. Atlanta VAMC, Rehab R&D Center on Geriatric Rehabilitation, Decatur, GA., USA.

Story, M.F. (2001). The Seven Principles of Universal Design, In W.F.E. Preiser & E. Ostroff (eds.), Universal Design Handbook, McGraw-Hill, New York, USA.

Vavik, T. (ed.) (2008). Inclusive Buildings, Products and Services: Challenges in Universal Design. Tapir Academic Press, Trondheim, Norway.

Watters, C. (2007a). Glendale Man's Segway Stirs Disability Debate: Rider's Indoor Access at Heart of Controversy, The Arizona Republic, November 16.

Watters, C. (2007b). Convenience Becomes

Controversy: Segways Aid Disabled, but Businesses Fear Backlash, The Arizona Republic, November 26.

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