

Universal Design and the ICF

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The IDEA Center is home to the RERC on Universal Design and the Built Environment Project. A central focus of our program is the development of Evidence Based Guidelines. We view this work as a way to support increased utilization of research and increase communications between stakeholders. We will use the ICF framework to develop evidence based guidelines and a database of research evidence. This effort will involve two projects in the RERC program and these initial activities:

- Develop low cost methods for measuring UD effectiveness
- Develop benchmarks for effectiveness
- Reconcile ICF and Principles of UD
- Survey state of the art in selected areas
- Develop evidence based guidelines
- Involve stakeholders in developing guidelines

The following key points will be made in the paper:

- Universal design is the new paradigm for removing environmental barriers to function, activity participation and social participation.
- UD is highly compatible with the ICF model.
- A body of evidence for practicing UD needs to be assembled
- The ICF can be used to organize that body of evidence and guide research
- A crosswalk is needed to reconcile the ICF with UD
- Participation of all stakeholder groups is desirable in developing the body of evidence

Universal design is a normative concept used as a goal in design of products, environments and communication systems. It is usually defined as “The design of products and environments to be usable by all without the need for adaptation or specialized design.” It can also be applied to any business practice that involves consumer interaction. Rather than creating specialized environments and products to serve a pre-defined population based on impairment or age, universal design seeks to make the everyday environment more effective for people with a broader range of abilities. In universal design, the environment is viewed as a “field of opportunity” rather than as a prosthetic support. Individuals maximize their potential by gaining access to resources around them.

Adopting universal design will not eliminate the need for assistive technology but it will lead to more equitable use of community resources and reduce the total cost of assistive technology and

its support system. By including all people in its target population, not just people with disabilities, universal design seeks to improve function, activities and social participation for the entire population, reduce the barriers created by the stigma associated with disability, and improve social integration of people with disabilities.

How can you recognize a universal design? It is not simply a matter of providing an accessible environment in accordance with codes and standards. The photographs of the picnic area demonstrate that one can have a functionally accessible, code compliant environment but not a universal design. The only accessible picnic tables are located in the parking lot. But this creates isolation and stigma for their users. A universal design approach would have made as many tables as possible fully accessible throughout the main part of the picnic area. Universal design involves social participation as well as function. In fact, this example supports the concept of universal design as an alternative to traditional accessible design. The sign prohibiting use by others demonstrates that the accessible feature of the “reserved” tables were highly desirable by others. Thus, a local ordinance was passed to ensure that people with disabilities could get access to this valuable resource on a priority basis.

It is important to note that universal design is not an absolute state. In many cases, such as in less developed economies, or where traditions and customs are difficult to overcome, the introduction of universal design must be incremental. This evolutionary approach recognizes differences in resources available and cultural constraints.

Even in highly developed countries, some traditions and customs are difficult to overcome and political opposition from special interest groups can be significant. In some environments, like historic buildings, using universal design strategies that would be ideal in new buildings may not be desirable. New technologies, like virtual reality, however, may make a higher level of accessibility feasible in the future.

Thus, the introduction of universal design must often be incremental. This evolutionary approach recognizes differences in resources available, cultural constraints and political realities. Moreover, it suggests using a strategic planning approach toward implementation over a long term time frame.

The seven “Principles of Universal Design” were developed almost ten years ago to help design practitioners adopt and implement universal design concepts. They are a set of broad design goals and related guidelines. The Principles are internationally acknowledged as defining what UD is, but they are criticized by some for being vague, incomplete and difficult to understand. Others argue that they apply more to product and graphic design than building design.

Principle 1 is Equitable Use. The design should make it equally usable by everyone. Ideally, the means by which people use the building should be the same. If that isn’t possible, the means provided must be equivalent in terms of their privacy, security, safety and convenience. The photo shows a ramp at the Rose Center for Earth and Space at the American Museum of Natural History in New York City. This ramp serves as the main exit from the planetarium for all members of the audience. Everyone uses the same exit and they all get visual exposure to the other parts of the museum. Along the ramp, there is an exhibit about the evolution of the

universe. Some services for visitors with visual and hearing impairments and those who do not speak English are provided.

Principle 2 is Flexibility in Use. The design should allow people to use the features in more than one way. It should accommodate people who are right handed or left handed, adults and children, and be adaptable to the individual user's pace. The design should have the built-in flexibility to be usable even when it is used in an unconventional or unanticipated manner. In the photo, a handheld height adjustable showerhead can be used by people of all sizes and ages.

Principle 3 is Simple and Intuitive Use. The design should make it easier for everyone to understand the purpose of each feature and how to use it. Also, its use should be intuitively obvious so that it operates as anticipated and can be used spontaneously. In the photo, entering a store or supermarket that has an automated door opener is easy and does not take much thought.

Principle 4 is Perceptible Information. The design should provide all essential information in a variety of modes (for example written, using symbols, tactile, and verbal) to ensure effective communication with all users regardless of their sensory abilities. The information must be presented with enough contrast so that it is distinguishable from its surroundings. In the photo, this building has raised, contrasting floor markings to guide people across undefined open spaces to the front desk.

Principle 5 is Tolerance for Error. Ideally, the design should eliminate or shield any design features that could prove hazardous to or inconvenience any user. When potentially dangerous conditions are unavoidable, users should receive warnings as they approach the design feature. The design should also anticipate accidental or unintended actions by any user to minimize inconvenience and protect the user from harm. In the example, this computer program is designed so that user errors are easily corrected with the click of a button.

Principle 6 is Low Physical Effort. The design should use design features that require little or no physical force to use them (for example replacing a traditional door knob with a level handle that does not require the ability to grasp or turn the wrist). If a low level of force is required, any user should be able to apply the necessary force without assuming an awkward or dangerous position. In this example, the lavatory has up and down controls that allow each user to adjust its height.

Principle 7 is Size and Space for Approach and Use. There should be an adequate amount of space to enable anyone to use designs (for example, providing knee space under a bathroom sink to allow someone in a seated position to use it). Also, the space needs to be arranged to provide a clear path of travel to and from important design features for all users. In the photo, the height of the concession stand counter permits convenient use by customers of varying heights.

The ICF conceptualizes environmental factors as mediating influences on the relationship of abilities to outcomes like activity, independence and social participation. Both the ICF and the Principles are based on similar underlying theoretical constructs. Both recognize the environment

as a major influence on human experience, and both recognize that people without impairments also experience limitations due to the influence of non-supportive environments.

Jerome Bickenbach recently identified the principles behind the development of the ICF. Clearly there is much compatibility between the ICF and the definition and Principles of Universal Design. Although all the ICF principles are relevant for universal design, the two that seem most compatible are the concept that experience of disability is *interactional* and *universal*. Universal design is based on the idea that interventions into the environment can increase function, activity level and social participation and that the impact of the intervention is partially influenced by personal factors like age and health. Furthermore, universal design seeks to improve the environment for all people, recognizing that all people can benefit from a more usable and safer environment. It is not focused exclusively on people with disabilities.

Since universal design is not typically mandated by law, there is often resistance to implementing it. To many producers, in particular, it appears to be an unaffordable luxury or a competitive disadvantage because it may increase the cost of a product or environment. In other cases, the effectiveness of innovative solutions using UD concepts is not known. Finally, there are many ideas that are not very effective in promoting the goals of UD. Thus, there is a need for evidence based practice in UD. There are many needs for information in evidence based practice of UD:

- Identifying the environmental factors related to UD
- Identifying the questions the designer needs to ask
- Finding the information needed to answer the questions
- Finding examples of best practices

The ICF can be very useful in organizing a body of evidence that can help designers answer the questions posed above. There are several advantages of using the ICF for this purpose:

- ICF is the international language about function and disability
- It facilitates multi-disciplinary communication
- It can be used to clarify the relationship between environmental factors, personal factors and outcomes (function, activities, participation)
- It can help link research to practice
 - For the practitioner - identify knowledge to apply to specific problems
 - For the researcher - identify research needs

Let's look at an example of how the ICF can help organize information for design.

E2500 is the Environmental Factor about sound intensity. Many architectural projects ignore the acoustic qualities of ordinary spaces. The literature on aging and hearing reveals that background noise can be a particularly difficult problem for older people. The evidence based guidelines would identify Sound Intensity, E2500, as a particular problem for this group and provide evidence from the research on the extent of the problem, qualitative recommendations and quantitative information on building performance.

Here's another example that is not so straightforward. E430 is the Environmental Factor about attitudes of people in positions of authority. Knowing about the importance of this factor is a first step in UD. Designers need to know how attitudes of their clients can limit the implementation of UD and how to overcome negative attitudes. Using the ICF to structure a knowledge base would include reference to this important factor, information that could overcome attitudinal barriers such as demographic data, and information on effective methods that could raise awareness such as simulation exercises. This is an example of how the ICF can expand the base of evidence of design beyond the issues that are the conventional focus of design projects.

Reconciling UD with the ICF requires several tasks. First, the definition of UD and the Principles currently do not reference the ICF, although they embody the principles behind it. Thus, a revision of both would help clarify the concept of UD and tie it directly to the ICF. After such a revision is completed, then a crosswalk document between the Principles and the ICF can be developed. The ICF does not provide a mechanism to identify and search for answers to design questions and build a data base. Such an application must be developed and mapped to the ICF classification system using the crosswalk document. Third, some of the Environmental Factors are not well conceived. They may need modification and elaboration to develop effective guidelines. For example, E2500, Sound Intensity, used in the first example above, does not address all the issues in quality of the acoustic environment, e.g. reverberation, frequency, etc. The process of writing the guidelines with reference to the ICF will help to test the Environmental Factors. This is likely to lead to recommendations that will improve them in the future.

Our first task in launching the Evidence Based Guidelines Project is to re-conceptualize universal design to reconcile it with the ICF model of disablement.

We believe the definition of universal design should be revised to:

- Incorporate function, activity and social participation
- Be explicit about the process of continuous improvement
- Accommodate cost and social difference

We believe that the Principles should be revised to:

- Focus design goals on ICF outcomes - functions, activities and participation
- Develop guidelines for different domains (EF)
- Tie the guidelines to a body of evidence – knowledge base of research
- Develop benchmarks to use as comparison - best practices
- Use simpler and less ambiguous language that end users can understand

We have developed a preliminary revision of the definition of universal design:

Universal Design of products, environment and systems is a

- ...process of continual improvement
- ...to improve function, activity and participation for all users,
- ...and to extend those benefits to an ever broader population
- ...within the context of resources available.

Our proposed revisions to the Principles are as follows:

Identity: Support the construction of positive self image and social status for the end users (1, 2)

Social integration: Support effective participation by all and reduce barriers between user groups (1,2)

Cultural appropriateness: ensure that differences in cultural values and attitudes are respected (1,2)

Awareness: Make information needed for safe and effective use readily available in all necessary forms (3)

Understanding: ensure that the methods of operation and use are easily understood by all users (4)

Comfort: ensure that the physical demands for safe and effective use are within the comfort range of the widest range of people (6)

Body fit: Accommodate people with the widest range of body sizes, postures and movement abilities (7)

The numbers in parentheses above refer to the original Principles. The first three Principles would address Participation and the last four Function. The Guidelines would address Activity issues which are directly related to the domain of design that is being addressed. We propose deleting 2. Flexibility in Use because it is a strategy for achieving outcomes rather than an outcome in itself and it could be used to address all the other principles. We believe that Tolerance for Error is actually encompassed by the other Principles that are concerned with function.

We kept the number of Principles the same because seven items are the most that an individual can remember easily. We modified the names and descriptions to reflect ICF concepts and terminology used in the research and design literature, avoiding terms that are difficult to translate and confusing like “Tolerance for Error”.

The proposed crosswalk approach includes these steps.

1. For selected Environmental Factors, e.g. entering and exiting buildings, Guidelines for each revised Principle will be identified in the literature
2. We will identify research and practice based evidence that supports outcomes for each Guideline. The evidence will be summarized and citations to the sources identified. Cross references to the applicable Functions, Activities and Participation factors in the ICF will be established.
3. Research needs will be identified where there is not enough evidence to support a Guideline. Confidence ratings for the available evidence will be established.
4. Best practice examples will be identified for implementation of Guidelines. Where none exist, needs for development, e.g. new technologies, products and demonstration implementations will be identified.
5. Modifying factors related to the ICF Health Conditions and Personal Factors will be identified that suggest altering the Guidelines in different contexts and for different target populations.

6. After several testing out the framework using several Environmental Factors, we will develop suggestions for improving the ICF Environmental Factors to make them more effective in practice.

Guidelines will be organized according to Activities and Environmental Factors. For each, we will develop a set of Guidelines related to each Principle. Associated with each Guideline will be a short review of research evidence. Where effectiveness data and information on modifying factors is available, we will establish benchmarks using a “ladder approach” so that different levels of UD can be specified for different contexts. For example, current research demonstrates that the commonly used 32 in. (815 mm) clear opening does not accommodate the largest 10% of wheeled mobility users. But 35 in. (900 mm) would accommodate all wheeled mobility users. Guidance will be provided on what level to adopt for specific populations.

We are developing a process to facilitate participation in the development and testing of the Guidelines by a wide range of stakeholders. This process will involve the use of interactive websites. The development of the Guidelines will proceed in a cyclical fashion starting in a collaborative workspace with limited access. This space will be used by a small group of expert researchers, designers and consumers to write each set of guidelines (on each Environmental Factor). The experts will rate each version of the Guideline for confidence using a Delphi survey technique. Each participant will be able to actually revise the proposed guidelines using a similar approach as in Wikipedia, the online open encyclopedia.

Once a set of Guidelines has been developed, it will be published to a public website where stakeholders can review and comment but not make revisions. This site will also be used to nominate best practices. After a public comment period, one more cycle of revision will take place and candidate best practices evaluated. Then, the set of guidelines will be republished to the public site and illustrated by best practices.

The websites will be developed in summer of '06 and tested out by the end of October '06 with a focused project. Then we will move on to further cycles of development based on priorities established by the research team and feedback from stakeholders.

We would like to engage the ICF community in this endeavor. We can use your help in many ways:

- We need volunteers for the expert panel who are knowledgeable about the ICF
- We welcome suggestions to improve our process and approach
- Please review our websites when we get them working
- Publicize this effort to others who may be interested
- Take on an assignment or give students assignments -
- Writing guidelines for selected Environmental Factors
- Preparing state of the art reviews on evidence
- Submitting best practice candidates

We hope that the Community of Practice in universal design will expand and become more inclusive through this effort. We welcome your participation and hope that many of you will take ownership of a set of guidelines on Environmental Factors of interest to you. Although the

RERC project will focus on specific areas, we will maintain the websites to allow others the opportunity to work on other areas of interest to them, as long as they use the overall structure we establish.