Cognitive Accessibility

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Historic Understandings of Disability

• Historically, disability has been understood within a model that was an extension of the medical model, which conceived health as an *interiorized state* and health problems as an *individual pathology*; a problem within the person.

• Within such a context, disability was understood as a characteristic of the person; as residing with the person.
  – The person was seen as broken, diseased, pathological, atypical, or aberrant; as outside the norm.
  – Perhaps unavoidably, people with disabilities were, consequently, associated with numerous negative stereotypes.
  – Particularly with introduction of Mental Age estimates, led to “infantilization” of people with cognitive disabilities.
WHO ICIDH 1980

• In the context of health care, it became apparent by the late 1970s that individual pathology models offered a far too narrow perspective for effectively describing, understanding, and addressing the problems of people experiencing chronic or pervasive health issues, including disability.

• In 1980, the World Health Organization introduced the International Classification of Impairments, Disabilities, and Handicaps (ICIDH).
  – The ICIDH perspective for describing the impact of a health condition or pathology on human functioning were: (a) the exteriorization of a pathology in body anatomy and functions; (b) objectified pathology as expressed in the person’s activities, and (c) the social consequences of pathology (e.g. participation in social life domains).

• Later, it was recognized that besides the impact of health condition factors (pathology), contextual and environmental factors are of pivotal importance for understanding human functioning.
  – Human functioning is best understood in the context of a person-environment fit or interaction model.

• It was also understood that limitations in human functioning are not necessarily linear or causal consequences of a pathology, but that human functioning should be conceived as multiple interactive processes where each factor can influence each dimension of functioning and each other factor either directly or indirectly.
ICF and Human Functioning 2001

• International Classification of Functioning, Disability, and Health (ICF)
  – “The WHO's ICF reflects the modern day thinking about disability and embodies a paradigm shift in the way health and disability are understood and measured.”

A Model of Human Functioning
  – “Functioning is an umbrella term encompassing all body functions, activities, and participation.”
  – **Body functions** are the physiological functions of body systems (including psychological functions).
  – **Body structures** are anatomical parts of the body such as organs, limbs and their components.
  – **Activity** is the execution of a task or action by an individual.
  – **Participation** is involvement in life situations.
ICF and Disability

• Disability
  – Disability serves as an umbrella term for limitations in human functioning involving impairments, activity limitations, or participation restrictions.
  – Impairments are problems in body function or structure such as a significant deviation or loss.
  – Activity limitations are difficulties an individual may have in executing activities.
  – Participation restrictions are problems an individual may experience in involvement in life situations.
  – Contextual Factors are (a) environmental factors and (b) personal factors
    • Environmental factors make up the physical, social and attitudinal environment in which people live and conduct their lives.
ICF and Cognitive Disability

• Cognitive Disability
  – Cognitive Disability refers to impairments (e.g., problems in body function or structure), activity limitations (e.g., difficulties in executing activities), or participation restrictions (e.g., problems with involvement in life situations).
  
  • That is, cognitive disability refers to *limitations* in *human functioning*. These limitations are a result of impairments to Central Nervous System functions.
  
  • Although the etiology of a cognitive disability resides in some form of CNS impairment, cognitive disability itself can only be understood in the context of the person-environment fit/interaction and how that fit/interaction impacts human functioning (e.g., activity and participation).
Changing Understanding of Disability
Relevance to Diagnosis

• Movement away from reliance solely upon measures of intelligence.
• Shift in terminology to reflect changes in understanding disability (e.g., intellectual disability instead of mental retardation).
• Adoption of assumptions associated with diagnosis:
  – Limitations in present functioning must be considered within contexts of community environments typical of the person’s age peers and culture;
  – Within an individual, limitations often coexist with strengths;
  – With appropriate personalized supports over a sustained period, the life functioning of the person with intellectual disability generally will improve.
Relevance to Cognitive Accessibility

• Person-environment fit models move the focus from ‘fixing’ the person to narrowing the gap between personal capacities and demands of the environment;
  – Strengths-based and outcomes oriented.
  – Disability is part of the continuum of “typical human functioning” and not apart or separate from that.
  – Technology becomes a critical support to narrow that gap, and maybe the most important support.
What is “Cognitive”

- Carroll’s (2003)* Taxonomy of Human Cognitive Abilities
  - Describes “typical” human functioning as it pertains to cognitive functioning.
    - Language ability and auditory reception
      - Reading and writing
    - Reasoning and idea production
    - Memory and learning
    - Visual Perception
    - Processing speed
    - Reading and writing
    - Acquired knowledge and achievement


See also “Cattell-Horn-Carroll theory of cognitive abilities
Cognitive Accessibility

• Technology can provide a support that narrows or eliminates the gap between personal capacity and demands of the environment or context.

• Environments, technology, and materials that are “cognitively accessible” are those incorporate design features to ensure that people with limitations in cognitive abilities—including language ability and auditory reception, reasoning and idea production, memory and learning, visual perception, cognitive speed, and knowledge and achievement—are able to access those environments and use the technology and materials.
Overarching Issues in Cognitive Accessibility

• Creating accessible web sites is only part of the equation.
  – Hardware and software must be accessible as well.
• Principles of Universal Design
  – http://trace.wisc.edu/world/gen_ud.html
  – http://www.ncsu.edu/www/ncsu/design/sod5/cud/
Principles of Universal Design

**The Principles of Universal Design**

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 current concentration level.

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

5. **Tolerance for Error**
   - The design minimizes hazards and the adverse consequences of accidental or unintended actions.

6. **Low Physical Effort**
   - The design can be used efficiently and comfortably and with a minimum of fatigue.

7. **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, position, or mobility.

**Guidelines**

**Equitable Use**
- Provide the same means of use for all users, identical whenever possible, equipment when not.
- Avoid segregating or stigmatizing any users.
- Make provisions for privacy, security, and safety equally available to all users.
- Make the design appealing to all users.

**Examples**
- Power doors with sensors at entrances that are open for all users.
- Integrated, unobtrusive, and adaptable seating in accessible areas such as sports arenas and theaters.

**Flexibility in Use**
- Provide choice in methods of use.
- Accommodate right- or left-handed access and use.
- Facilitate the user's accuracy and precision.
- Provide adaptability to the user's pace.
- Allow suitable options for left- or right-handed users.

**Examples**
- Power doors with sensors at entrances that are open for all users.
- A water fountain with a spray nozzle that allows users to adjust the pressure and angle.

**Simple and Intuitive Use**
- Accommodate a wide range of individual preferences and abilities.
- Use of the design is easy to understand, regardless of the user's experience, knowledge, language skills, or current concentration level.
- Ensure the design is consistent with user expectations and intuition.
- Provide ample information, consistent with its importance.

**Examples**
- A moving sidewalk or escalator in a public space.
- An instruction manual with drawings and no text.

**Perceptible Information**
- Use different modes (pictures, verbal, tactile) for redundant presentation of essential information.
- Provide “legible” presentation of essential information.
- Provide a variety of techniques or devices used by people with sensory limitations.

**Examples**
- Tactile, visual, and audible cues and instructions on a thermostat.
- Redundant queuing e.g., voice communications and signage in airports, train stations, and subway cars.

**Tolerance for Error**
- Arrange elements to minimize hazards and the adverse consequences of accidental or unintended actions.
- Provide warnings of hazards and errors.
- Provide fail safe features.
- Discourage unintentional actions in tasks that require vigilance.

**Examples**
- A double cut car key easily inserted into a recessed keyhole in either of two ways.
- An “ands” feature in computer software that allows the user to correct mistakes without penalty.

**Low Physical Effort**
- The design can be used efficiently and comfortably and with a minimum of fatigue.

**Examples**
- Locator or loop handles on doors and faucets.
- Touch levers operated without a switch.

**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, position, or mobility.

**Examples**
- Controls on the front and clear floor space around appliances, machines, dispensers, and other elements.
- Wide gates at subway stations that accommodate all users.

**Notes**
- The Principles of Universal Design are not intended to constitute all collectively good design, only universally usable design. Considerations, other factors are important, such as aesthetics, cost, safety, gender and cultural appropriateness, and these aspects must also be taken into consideration when designing.

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## Universal Design Features Reported (n=426)

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<th>Universal Design Feature</th>
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Cognitive Accessibility Design Strategies

• Error minimization strategies
  – Remove buttons from screen rather than “graying them out.”
  – Flexibility and simplicity in user interface.
    • Reduced screen clutter
    • Provide only needed function
    • Consistent placement of familiar buttons
Cognitive Accessibility Design Strategies

- **Simplicity of Use**
  - Minimize cryptic Metaphors/images
  - Minimize physically difficult options (double clicking, scroll bars).
  - Focus on primary functionality of app/device/website.
  - Cursor over voice vs. Cursor over text.

- **Multimodal presentation.**
Barriers to Simplicity: Feature Creep

“It was just going to be a laser printer before we started adding features.”
The Evolution of the Alarm Clock
Barriers to Simplicity: Security

"IT asked me to drop this on your desk. They're your new passwords."
Barriers to Simplicity: Security
Barriers to Adoption and Use: Cost

“Our new product is designed for the average Joe with fifty million dollars.”
Cognitively Accessible Web Pages

The ArcLink.org (http://www.thearclink.org/arc/index.asp)

- Create uncluttered pages with consistent layout
- Use Plain language/People First language/Low readability score
- Make the site accessible to screen readers, operating system narrators, and text-to-speech software
- Use graphics, audio, and video to support text
- Avoid jargon, including Internet-related jargon
- Use large print and simple fonts
- Try to limit scrolling
- Make sure pages will print as seen on the screen
- Use a consistent and straightforward navigation system
- Include a “how to use this site” section


WebAIM
http://webaim.org/articles/cognitive/
Cognitively Accessible Web Pages

Rehabilitation Engineering Research Center for the Advancement of Cognitive Technologies
http://www.rerc-act.org/

& Beneficial Designs Inc.

• Development of uniform standards for cognitive technologies.