Design Guidelines and Goals

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HCI Design Goal

- The key question:

  *How to optimise the user's interaction with the system / environment, so that it supports and extends the user's activities in **useful**, **efficient**, and **usable** ways*

- Motto:

  successful HCI designs ⇔ task- & user-profiled HCI designs

  context

  who the user is?
  what his or her task is?
  where is he or she?
  how does he or she feels?

User- profiled design

- People are so different that there can be no image of an ‘average’ user.
- User diversity:
  - perceptual abilities (vision, hearing, reflexes, disabilities)
  - cognitive abilities (long-term memory, learning, attention, search, scanning) (affected by: stress, fatigue, monotony, aging, etc)
  - preferences (graphics vs. textual, dense vs. sparse, etc.)
  - cultural background
  - computer-related knowledge

successful HCI designs ⇔ user-profiled HCI designs (adopting *useful*, *efficient*, *usable* interaction devices / types)

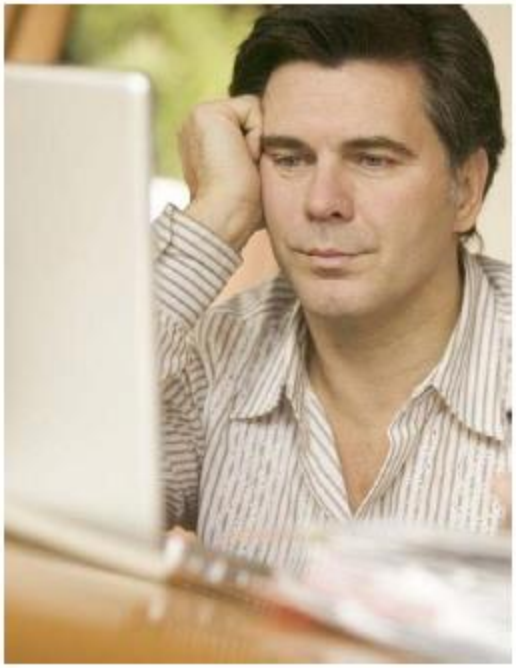
Task-profiled Design

successful HCI designs ⇔ task-profiled HCI designs
(adopting *useful*, *efficient*, *usable* interaction devices / types)

Environment-profiled Design

successful HCI designs ⇔ environment-profiled HCI designs
(adopting *useful*, *efficient*, *usable* interaction devices)

Affective Design



successful HCI designs ⇔ affective HCI designs
(adopting *useful*, *efficient*, *usable* interaction devices / types)

HCI affective aspects

- HCI affective aspects ⇔HCI properties generating users' emotional responses
- • Affective Aspects of HCI:
- aesthetic characteristics (how 'excellent', 'cute', 'cool' the HCI design is)
- usability characteristics (how frustrating or pleasing is to work with the system)

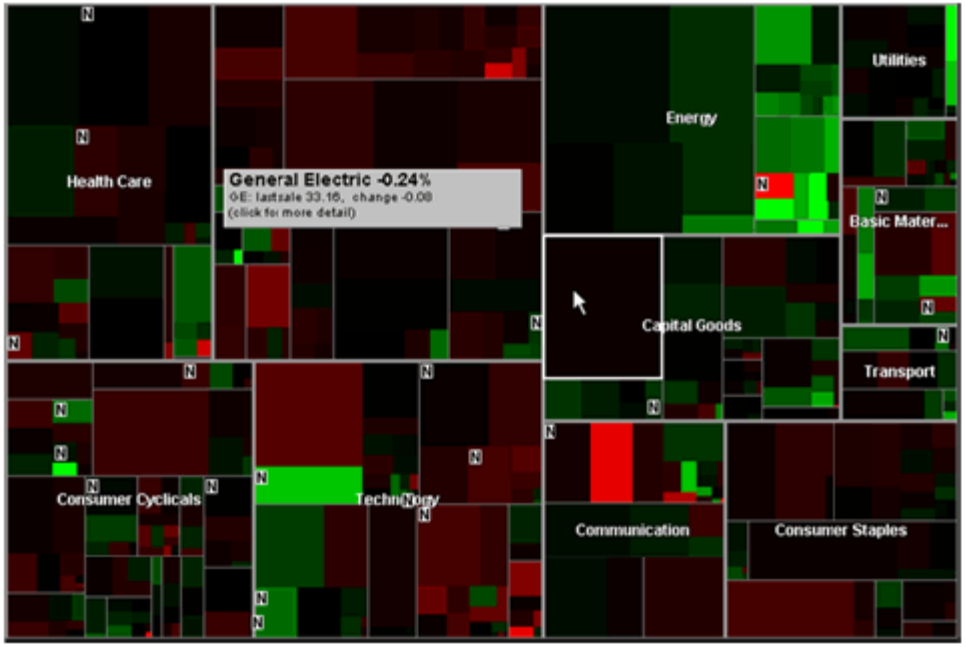
HCI Design: Affective Aspects

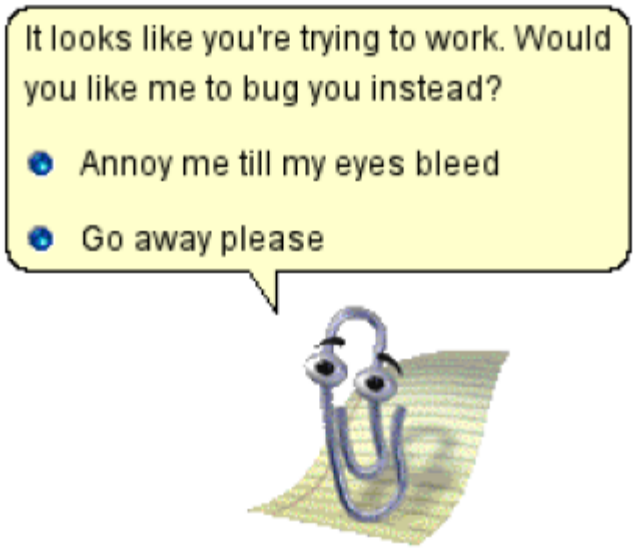
- HCI affective aspects ⇔ HCI properties generating users' emotional responses
- Affective Aspects of HCI:
  - ➢ aesthetic characteristics (how 'excellent', 'cute', 'cool' the HCI design is)
    - have a significant effect on users' willingness to try a new design
    - have an effect on the user's perception of the system's usability
    - how pleasing look-and-feel is: shapes, fonts, colour, balance, graphics

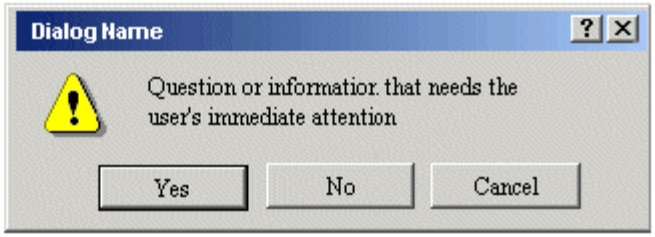
HCI Design: Affective Aspects

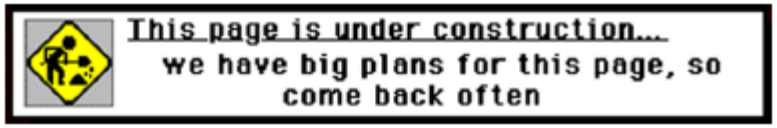
- HCI affective aspects ⇔ HCI properties generating users' emotional responses
- Affective Aspects of HCI:
  - usability characteristics (how frustrating or pleasing is to work with the system)
    - Does the application works or it crashes?
    - Does the application works properly (as specified in functional description)?
    - Are the user's expectations met?
    - Are the error messages clear and instructive?
    - Is the user in command?
    - Is the design too flashy, overloaded, noisy, kitsch, patronizing?

HCI Design: Affective Aspects









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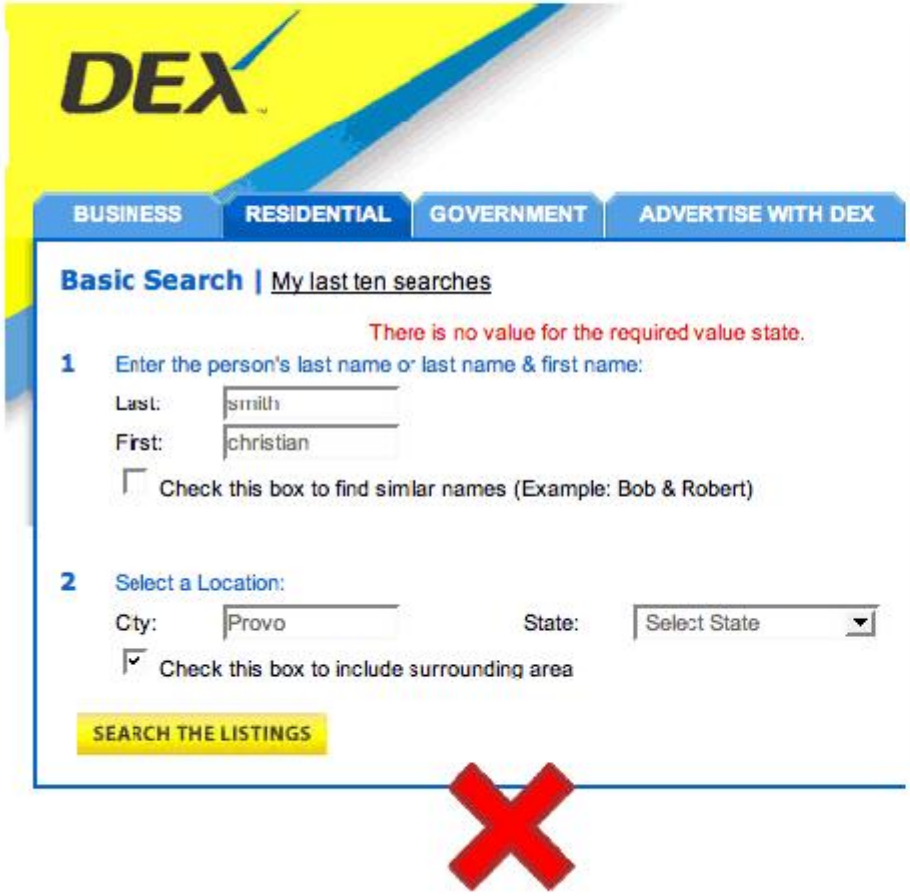

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    - Is the design too flashy, overloaded, noisy, kitsch, patronizing?
    - Does the application do what the user wants it to do?

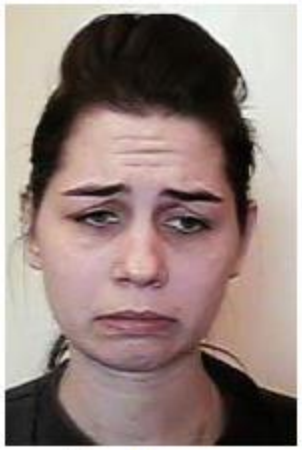
Affective aspects

- • HCI affective aspects ⇔HCI properties generating users' emotional responses
- • Affective Aspects of HCI:
- aesthetic characteristics (how 'excellent', 'cute', 'cool' the HCI design is)
- usability characteristics (how frustrating or pleasing is to work with the system)
- • **Dealing with the user's frustration:**
- following the **principles** of good HCI design
- building affect-sensitive interfaces (**affective computing**)

Affect-sensitive Design: Sensing


Anger


Surprise


Sadness


Disgust


Fear


Happiness

- Affect-sensitive interfaces (affective computing) – systems able to sense, analyse, and adapt HCI in accordance to the user's affective response
- Current systems can recognise only six basic emotions (rather useless)
- Methodology: single- or bi-modal (based on facial and/or vocal expressions of emotion)
- Very limited performance and robustness, adoption of strong assumptions
- Very active area of current research on HCI

Affect-sensitive Design: Acting

- Conversational Interaction ('Would you like some help?', 'Well done! Another exercise?')
  - anthropomorphism vs. text-only
  - ⊕ : more natural HCI, can have a motivational effect
  - ⊗ : can be tiresome, annoying, deceptive, and cause confusion
- Proactive Interaction (affect-sensitive prediction of the problem and drawing the user's attention to the solution in an non-invasive manner)
  - ⊕ : less tiresome / annoying
  - ⊗ : user may have the feeling that (s)he is not in control

Accessibility, Usability and Engagement

Aims

- To provide advice and guidance that will result in high quality designs.
- • When interactive systems were used almost exclusively in the workplace good design was thought of mainly in functional terms; did the system do what it was meant to?
- • Now computers and other interactive systems and devices have moved out of the work arena and into the wider world of home, community and personal products.
- • Now designers have to consider not just the functionality of a system but also the whole experience of using it and owning it.

Good Design

- • cannot be summed up in a simple way and nor can the activities of the interactive systems designer
- • One view might say ‘The interactive systems designer aims to produce systems and products that are accessible, usable, socially and economically acceptable and engaging’.
- • Another view might say ‘The interactive systems designer aims to produce systems that are learnable, effective and accommodating’.
- • A third view could be ‘The aim of the interactive systems designer is to harmonize the PACT elements in a domain’.

Key issues

- Access concerns removing the barriers that would otherwise exclude some people from using the system at all.
- Usability refers to the quality of the interaction in terms of parameters such as time taken to perform tasks, number of errors made and the time to become a competent user.
- Acceptability refers to fitness for purpose in the context of use. It also covers personal preferences that contribute to users 'taking to' an artefact, or not.
- Engagement concerns designing for great, exciting and riveting experiences.

Accessibility

- Access to physical spaces for people with disabilities has long been an important legal and ethical requirement
- now becoming increasingly so for information spaces.
- Legislation requires software to be accessible.
  - UK's Disability Discrimination Act
  - Section 508 in the US
- UN and W3C have declarations and guidelines on ensuring that everyone can get access to information that is delivered through software technologies.

Extraordinary users

- With an increasingly wide range of computer users and technologies designers need to focus on the demands their designs make on people's abilities.
- The sort of issues that face an ordinary user in an extraordinary environment (such as under stress, time pressures, etc.)
- are often similar to the issues that face an extraordinary user (e.g. a user with disabilities) in an ordinary environment.

Exclusions

- Physically
  - Inappropriate siting of equipment
  - through input and output devices making excessive demands on their abilities.
- Conceptually
  - people may be excluded because they cannot understand complicated instructions or obscure commands
  - they cannot form a clear mental model of the system.
- Economically
  - people are excluded if they cannot afford some essential technology.

- Cultural exclusion
  - making inappropriate assumptions about how people work and organize their lives
- Social exclusion
  - equipment is unavailable at an appropriate time and place

Principles of Universal Design

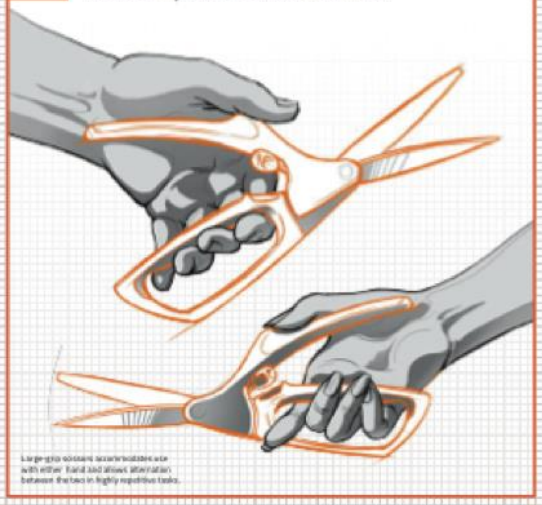
- Equitable Use: The design does not disadvantage or stigmatize any group of users.
- Flexibility in Use: The design accommodates a wide range of individual preferences and abilities.
- Simple, Intuitive Use: Use of the design is easy to understand, regardless of the user's experience, knowledge, language skills, or current concentration level.
- Perceptible Information: The design communicates necessary information effectively to the user, regardless of ambient conditions or the user's sensory abilities.

The Principles of Universal Design

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.

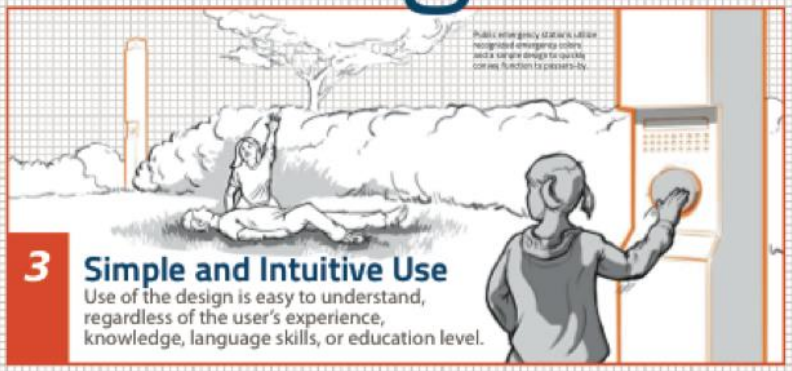
1 Equitable Use

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



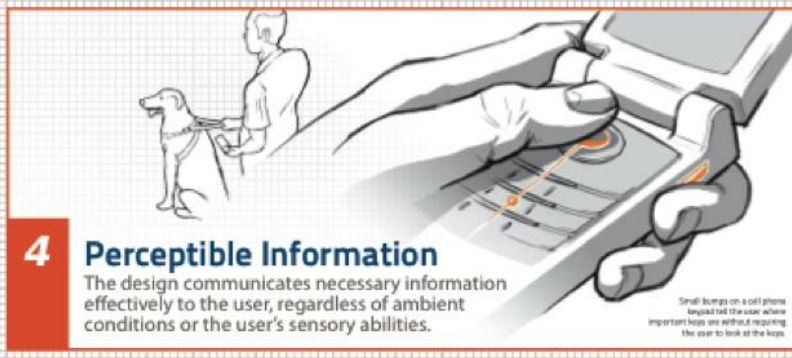
2 Flexibility in Use

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 education level.



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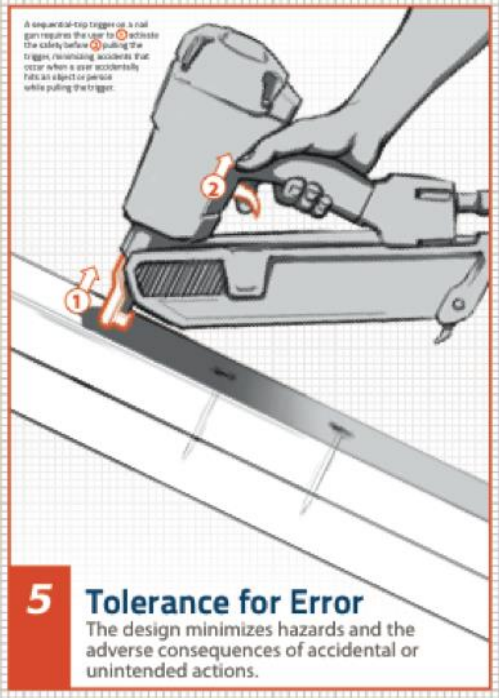
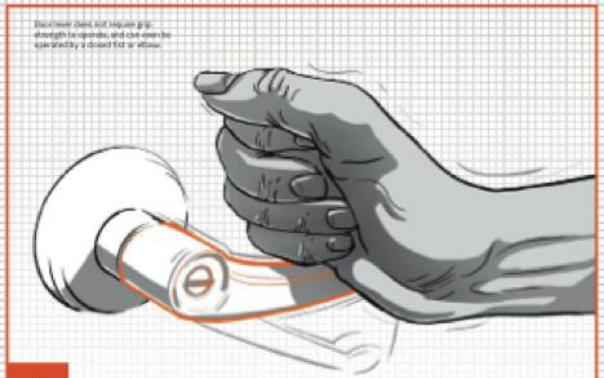


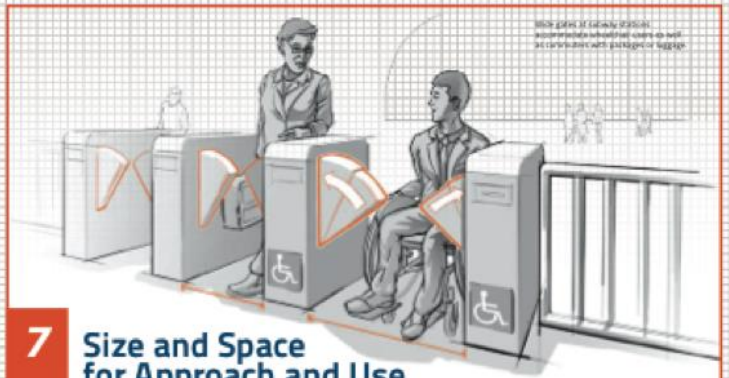
5 Tolerance for Error

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, posture, or mobility.

Center for Universal Design at NC State

Web: design.ncsu.edu/cud

E-mail: cud@ncsu.edu

THE PRINCIPLES OF **UNIVERSAL DESIGN**

Version 2.0 (4/1/97)

1 EQUITABLE USE

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

GUIDELINES

1a. Provide the same means of use for all users: identical whenever possible; equivalent when not.

1b. Avoid segregating or stigmatizing any users.

1c. Make provisions for privacy, security, and safety equally available to all users.

1d. Make the design appealing to all users.

EXAMPLES

- Power doors with sensors at entrances that are convenient for all users
- Integrated, dispersed, and adaptable seating in assembly areas such as sports arenas and theaters

2 FLEXIBILITY IN USE

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

GUIDELINES

2a. Provide choice in methods of use.

2b. Accommodate right- or left-handed access and use.

2c. Facilitate the user's accuracy and precision.

2d. Provide adaptability to the user's pace.

EXAMPLES

- Scissors designed for right- or left-handed users
- An automated teller machine (ATM) that has visual, tactile, and audible feedback, a tapered card opening, and a palm rest

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.

GUIDELINES

3a. Eliminate unnecessary complexity.

3b. Be consistent with user expectations and intuition.

3c. Accommodate a wide range of literacy and language skills.

3d. Arrange information consistent with its importance.

3e. Provide effective prompting and feedback during and after task completion.

EXAMPLES

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

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.

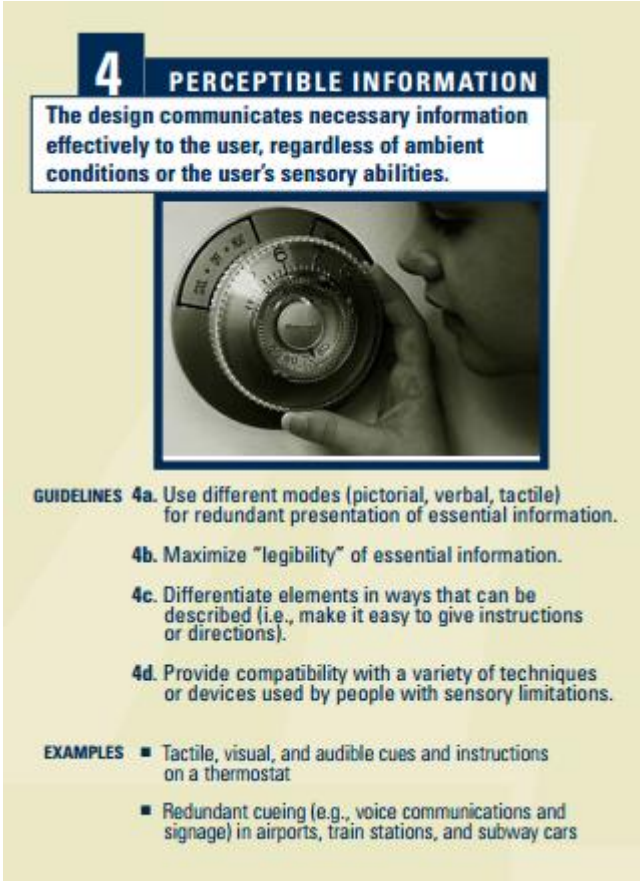
7 SIZE AND SPACE FOR APPROACH AND USE

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

Web usability testing

> Chapter 1: Design Process and Evaluation
> Chapter 2: Optimizing the User Experience
> Chapter 3: Accessibility
> Chapter 4: Hardware and Software
> Chapter 5: The Home Page
> Chapter 6: Page Layout
> Chapter 7: Navigation
> Chapter 8: Scrolling and Paging
> Chapter 9: Headings, Titles, and Labels
> Chapter 10: Links
> Chapter 11: Text Appearance
> Chapter 12: Lists
> Chapter 13: Screen-Based Controls (Widgets)
> Chapter 14: Graphics, Images, and Multimedia
> Chapter 15: Writing Web Content
> Chapter 16: Content Organization
> Chapter 17: Search
> Chapter 18: Usability Testing

http://guidelines.usability.gov/



http://www.ncsu.edu/www/ncsu/design/sod5/cud/pubs_p/docs/poster.pdf

Principles of Universal Design (continued)

- Tolerance for Error: The design minimizes hazards and the adverse consequences of accidental or unintended actions.
- Low Physical Effort: The design can be used efficiently and comfortably, and with a minimum of fatigue.
- Size and Space for Approach & Use: Appropriate size and space is provided for approach, reach, manipulation, and use, regardless of the user's body size, posture, or mobility.

Ensuring an accessible system

- include people with special needs in requirements analysis and testing of existing systems
- consider whether new features affect users with special needs (positively or negatively) and note this in specification
- take account of guidelines, include evaluation against guidelines
- include special needs users in usability testing and beta tests.

Assistive technologies

- Web browsers which read Web pages
- Screen enlargers which allow people to set and move the area of focus.
- Voice input is increasingly available - not just for text entry - also as substitute for mouse/keyboard control
- Keyboard filters can compensate for tremor, erratic motion, slow response time.

Design for all

- is just good design.
- aim is to design to cater for the widest range of human abilities.
- By considering access issues early in the design process, the overall design will be better for everyone.
  - new computer ‘architectures’ that can accommodate different interfaces for different users
  - better requirements generation processes
  - consideration of alternative input and output devices
  - adoption of international standards.
- We are all less abled at some point!

Usability

- Usability has always been the central pursuit of human-computer interaction (HCI).
- The original definition of usability is that systems should be ‘easy to use, easy to learn, flexible and which engender a good attitude in people’
- this definition, whilst still being valid hides many important issues.
  - e.g. accessibility, sustainability.
- The goals of usability are now primarily seen as concerned with efficiency and effectiveness of systems.

A high degree of usability

- Efficient in that people will be able to do things quickly, by expending appropriate resources
- Effective in that it contains the appropriate functions and information content, organized in an appropriate manner
- Easy to learn how to do things and remember how to do them after a while
- Safe to operate in the variety of contexts that it will be used
- Have high utility in that it does the things that people want to get done.

Acceptability

- Acceptability is about fitting technologies into people's lives
  - e.g. some railway trains have 'quiet' carriages where it is unacceptable to use mobile phones
  - cinemas remind people to turn their phones off before the film starts.
- An essential difference between usability and acceptability is that acceptability can only be understood in the context of use.
- Usability can be evaluated in a laboratory (though such evaluations will always be limited). Acceptability cannot.

Key features of Acceptability

- Political.
  - Is the design politically acceptable, do people trust it?
- Convenience.
  - Designs should fit in effortlessly to the situation.
- Cultural and Social habits.
  - concerned with the way people like to live… e.g. 'Spam' e-mail
- Usefulness.
  - usefulness in context.
- Economic.
  - Price and value for money.
  - new 'business model' is often a part of economic acceptability.
- Successful technologies

Engagement

- Engagement is concerned with all the qualities of an experience that really pull people in
- A sense of immersion that one feels reading a good book
- The challenge one feels when playing a good game
- The fascinating unfolding of a TV drama.
- Engagement is concerned with all the qualities of the interactive experience that make it memorable, satisfying, enjoyable and rewarding.
- If usability is concerned with optimizing the PACT elements in some domain, then engagement is when the elements are truly harmonized.

So, good design?

- Consider accessibility issues
- Consider usability - getting a balance between the PACT elements
- Consider acceptability - in the context of use
- Consider engagement - creating a true harmony between the PACT elements
- Consider the person-technology interaction