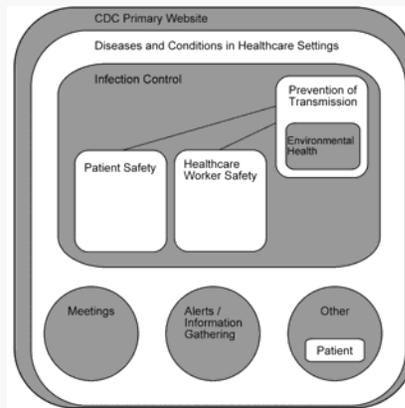
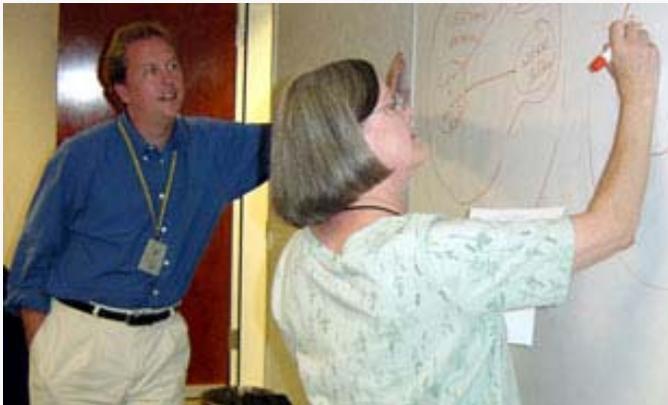


Primed for Design

Human Factors for Developing Usable and Accessible Health Applications



Chris Hass
American Institutes for Research

There is no cabal of evil product developers

Wouldn't it be great if there was a process...?

- Foster a realistic view of the product
- Enable you to weigh political and technical concerns
- Enable meaningful contributions and solutions
- Arm you to innovate



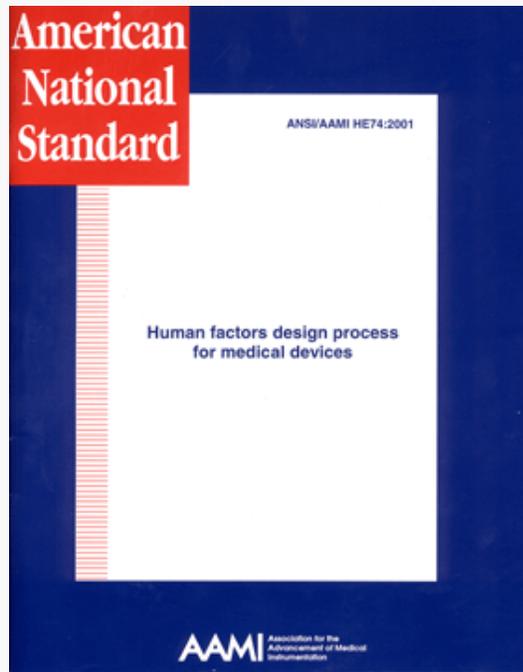
The Human Factors Process

- Knowing your users
- Conducting research
- Envisioning/Prototyping
- Obtaining User Input
- Analyzing Feedback

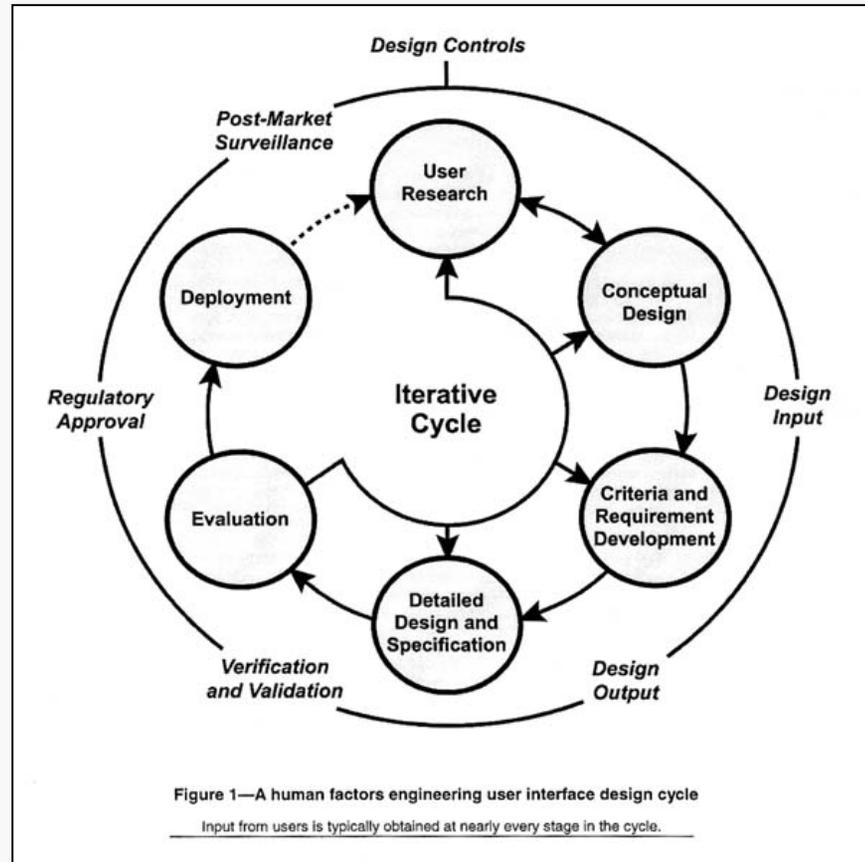
“Informal” human factors is usability



Human Factors Design Process for Medical Devices



ANSI/AAMI HE74:2001



What can you know about your users?

Define unique knowledge, limitations, expectations, abilities, skills

- Age, gender, education
- Professional certification
- Experience (w/product)
- Frequency of use
- English as first or second language
- Training: required, OTJ
- Impairments
- Previous experience w/related products?
- Use environment (light, noise)
- Emotions, stress level
- Solo or collaborative work
- Clinical environment
- Professional needs



User Profiles

Dr. Chief of Toys

- Energetic “up and coming” clinician
- Embraces new technology
- Abstract thinker
- Understands how things work
- Sees product fitting in the “big” picture



Nurse Betty

- Learns by memorizing steps
- Expects assistance learning to use new product
- Prefers to focus on pt and not technology
- Easily frustrated using computers



Uncle Fred

- Elderly diabetic pt
- Some vision and hearing impairment
- Unfamiliar with most technical devices
- Often neglects to perform healthcare tasks



How many users? What research activities?

- Research scope dictated by time/budget
- Demographic segmentation
- Where are you in the development cycle?
- Quantity v. quality
- Equalize the participants
- Define your “myths”



Tools for Obtaining User Input

Direct Contact

- Focus group
- Individual interview
- Requirements review
- Observing users' workplace
- Customer meetings
- Surveys (phone/internet)
- Participatory design
- Usability testing

Indirect Contact

- Data review (website logs)
- Customer/sales representatives
- Technical support feedback
- Warranty and repair data



Usability Testing

- Research focus on product or prototype
- Lab, field, or simulation based
- Users perform scenario-based tasks
- Directly observe user behavior
- Obtain users' reactions

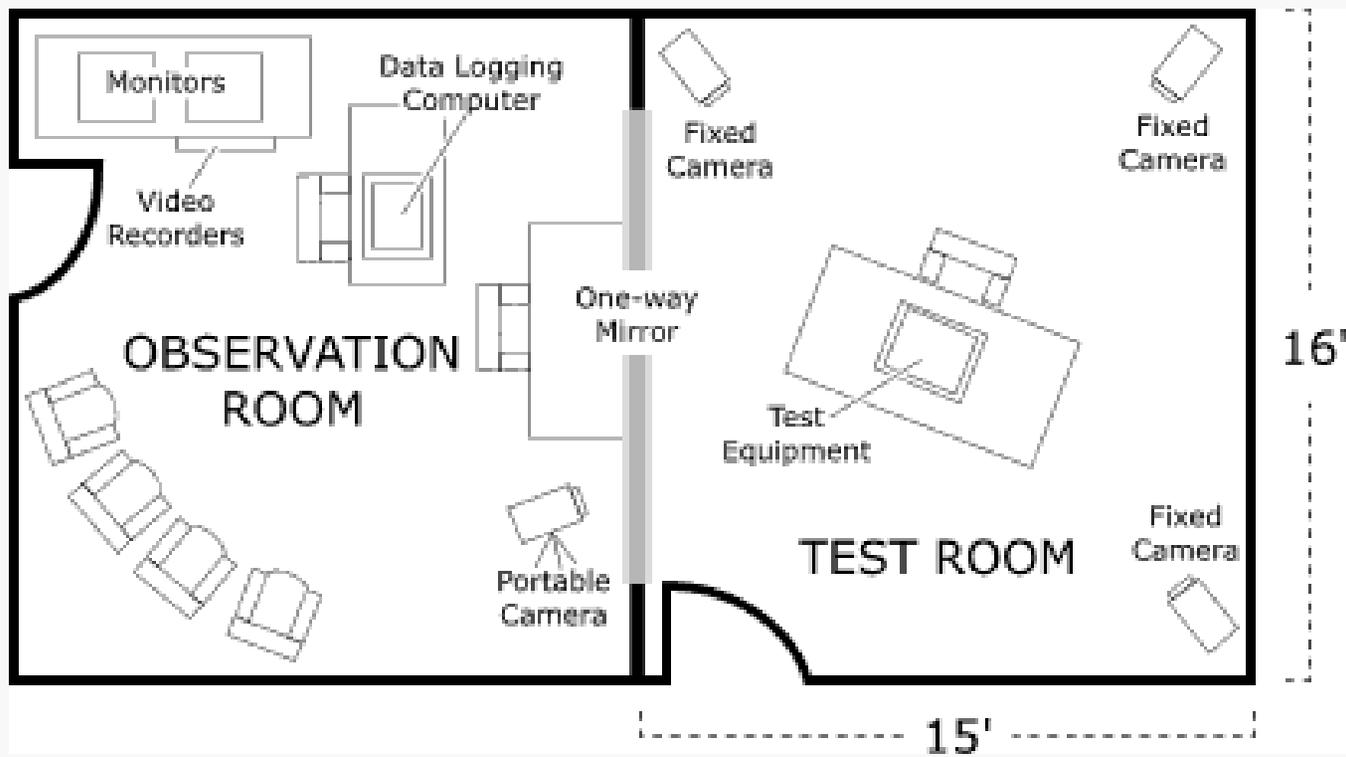


Case Study: CDC TB PDA Application

- 2003 Treatment of Tuberculosis Guidelines
- Two PDA operating systems
- 9 users (twice)
- Clinicians, nurses, RNs

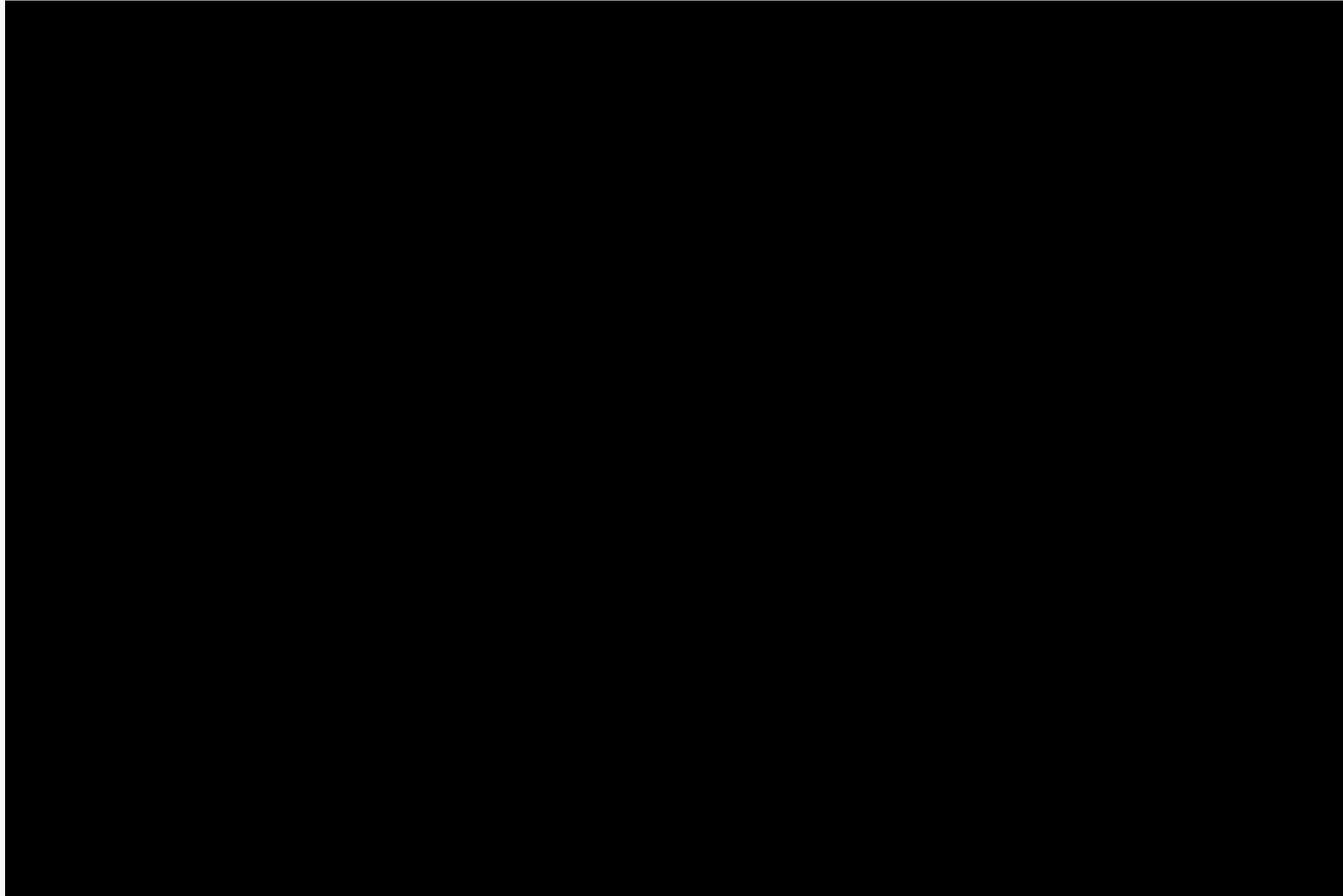


Usability Lab Setup





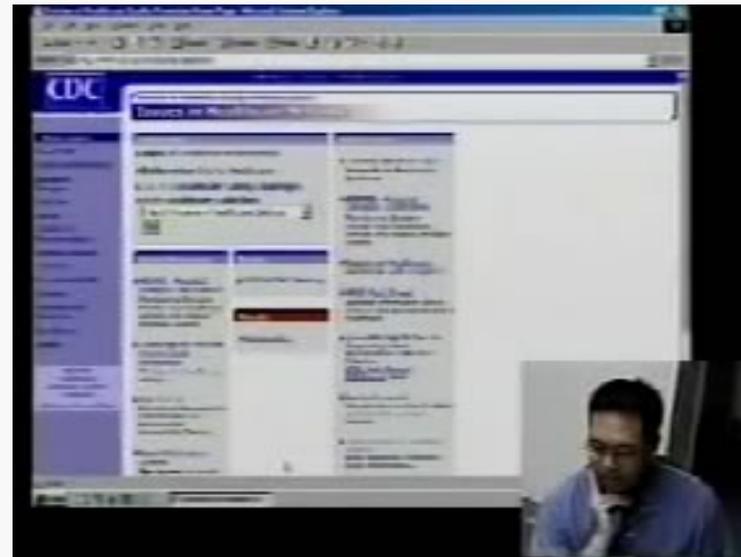
Participant using CDC TB application



Participant in medical simulator using infusion pump



Participant exploring medical website



Human Factors Activities

- Ensure users play an early and frequent role in product development
- Utilize a variety of techniques to obtain input
- Organize and prioritize inputs
- Evaluate designs with users
- Lather, rinse, repeat



Human Factors and Accessibility

- Determining users' needs/characteristics through research
- Understanding physical and environmental impacts on product use
- Adhering to regulatory standards
- Understanding interactions between people and technology
- Innovating solutions to use barriers



Accessibility

Concerns making products and services functionally available to all persons, regardless of whether they are interacting under limiting conditions such as:

- Inability to see or see well (blind, low vision)
- Inability to hear or hear well (deaf, hard of hearing)
- Inability to speak or speak clearly
- Limited reach, strength, manual dexterity
- Learning disabilities or cognitive limitations
- Difficulties carrying out time-sensitive tasks
- Situations where senses or abilities are compromised



Who is disabled?

- 54 Million Americans (1 in 5 or 20.6%)
- 34 Million are of voting age
- Life-expectancies increasing
- Americans aged 65 and older projected to increase 135% between 1995 and 2050
- You are, sometimes or all the time.



Ramifications of Limiting Conditions

For developers and product designers, limiting conditions pose significant challenges:

- They come singly or in combinations
- Products are often designed for specific mediums or environments
- Developers are forced to view designs in new ways
- Determining the research scope can be tricky
- Each disability comes with its own set of assistive technologies.



A Sampling of Assistive Technologies

- Speech-to-text / text-to-speech software
- Keyboards with large keys, alternatives to keyboards
- Communication aids
- Screen magnification tools
- TTY (text telephone)
- Wheelchairs
- Hearing Aids
- Alternative controls to operate machinery



A Word of Caution

You can't pick accessibility "targets"

- Accessibility means for all product users
- Has implications for budget, research scope

Accessibility is the law . . . mostly

- Our social responsibility
- The Rehabilitation Act Amendments of 1998
- Industry-specific standards
- International standards
- Web Content Accessibility Guidelines 2.0 (WCAG)
- Emerging standards



The Developer's Challenge

“Creating products (devices, environments, systems and processes) which are usable by people with the widest range of abilities, operating within the widest possible range of situations (environments, conditions, and circumstances), as is commercially practical.”

Source: Vanderheiden, G.C., and Tobias, J. (2000).
Universal Design of Consumer Products: Current Industry Practice. Madison, WI: Trace Research and Development Center.



Accessibility Benefits Usability

- Supports Universal Design
- Can lead to information hierarchy clarifications
- Leads to the adoption of new technologies, new tools
- Leads to more thoughtful and robust designs
- Can identify and clarify design problems
- Services and products available to wider audiences
- Supports “write once, read many” scenarios



Accessibility Benefits Usability

- Mandated compliance fosters standards adoption
- Increased interest in accessibility services
- Increased awareness of technology limitations
- Accessible products are more usable products



Accessibility is Good Business

- Accessibility increases employability: 1991-1994 +1.1 Million, U.S. Census Bureau
- 3x as many young adults employed in 1994 than 1986
- College enrollment leapt from 29% in 1986 to 44% in 1994
- Persons with disabilities are estimated as a \$188 billion market



Maximizing Accessibility

Expert-based approaches

- Heuristic evaluations
- Consultation with experts
- Literature/data reviews
- Screening techniques



Maximizing Accessibility

Automated tool-based approach

- Website evaluators (W3C, Bobby)
- Browser simulators (WebAim)
- Non-graphical browsers (Lynx Viewer)



Both Are Flawed

- Tools require subjective interpretation
- Tools evolve, strategies change
- You are not the target audience
- Access technologies are complex
- Access technology use is rarely intuitive



Overarching Strategies

- Employ a combination of solutions
- Engage a usability specialist
- Have persons with disabilities evaluate your product
- Use structured evaluations
- Access technologies are complex
- Access technology use is rarely intuitive



Tactical Strategies: Web Development

- Separate presentation from content
- Build to Web standards (W3C)
- Use ALT tags for all meaningful images
- Use “title” tags for links
- Do not use tables or frames for layout purposes
- Use “longdesc” to describe complex graphs and charts



Tactical Strategies (cont)

- Clarify your information hierarchy
- Use Cascading Style Sheets and XHTML
- Use “label” to link form labels and fields
- Use meta data tags properly
- Employ “skip links” to enable bypass of large lists of links
- Ensure your CSS and XHTML code is valid
- Ask access technology user(s) to try out your site



Thank you!

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