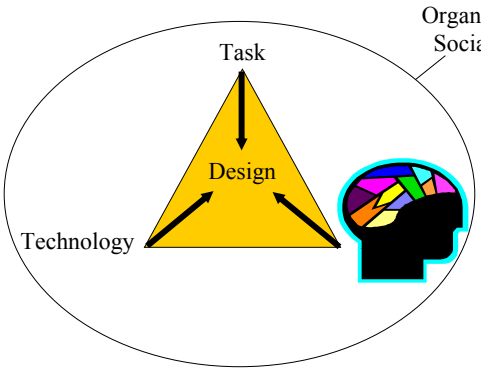
HCI Foundations: Individual Differences



Different users

Cultural Differences

- Culture is the collective programming of the mind, which distinguishes the members of one human group from another (Hofstede, 1980).
- Culture influences interface acceptance (Evers and Day, 1997)
- Design preferences that were especially related to culture were colors, menus, input devices, sounds and multimedia
- Coca cola in Chinese means 'bite the wax tadpole'
- Coco in Portuguese is the opposite of fragrance
- Dogs = low creature and insult in many cultures
- Many cultures do not understand baseball/football terms (e.g. "Got to first base", "Out in left field").

What to do then?

- Globalization
  - Product is "neutral" → "One size fits all"
  - Removing all culturally specific features from the system
  - If needed, changes at the interface level--not functionality
- Localization
  - Technical: e.g. sites w. reduced graphics in countries w. less advanced Internet connection
  - National Localization: following national boundaries
  - Cultural Localization: following cultural boundaries
- But careful, culture is not bounded by nations
  - One culture in many nations
  - One nation with many cultures

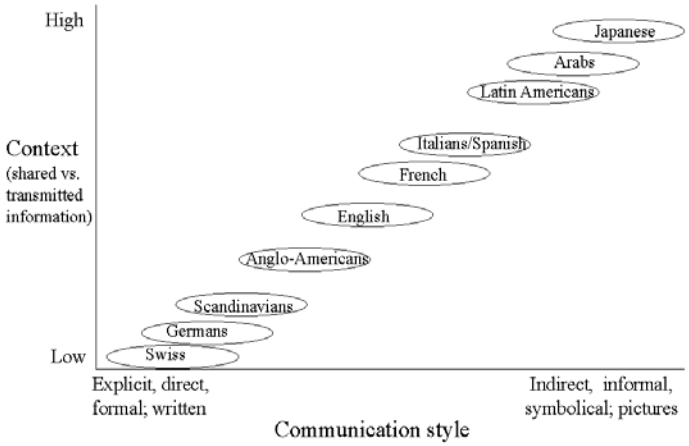
Yahoo! China

Yahoo! US

Hofstede's 5 Dimensions of Culture

- *Power-distance*: the extent to which the less powerful members of organizations and institutions accept and expect that power is distributed unequally
- *Individualism*: the degree to which individuals are integrated into groups
- *Masculinity*: the distribution of roles between the genders
- *Uncertainty avoidance*: a society's tolerance for uncertainty and ambiguity
- *Long-term orientation*: how a society deals with virtue regardless of truth

Hofstede's model



Culture vs. UI : Power Distance

- Metaphors
  - **High:** Institutions, buildings with clear hierarchy: schools, government, monuments, *etc.*
  - **Low:** Institutions, buildings with equality options: play/games, public spaces, *etc.*
- Mental Models
  - **High:** Reference data with no relevancy ranking
  - **Low:** Less structured data with relevancy
- Navigation
  - **High:** Restricted access, choices; authentication; passwords
  - **Low:** Open access, multiple options, sharable paths

Culture vs. UI: Power Distance

- Interaction
  - **High:** Severe error messages: "Entry Forbidden," "You are wrong;" wizards or guides lead usage
  - **Low:** Supportive error messages, cue cards
- Appearance
  - **High:** Images of leaders, nations; official music, anthems; formal speech
  - **Low:** Images of people, daily activities; popular music; informal speech

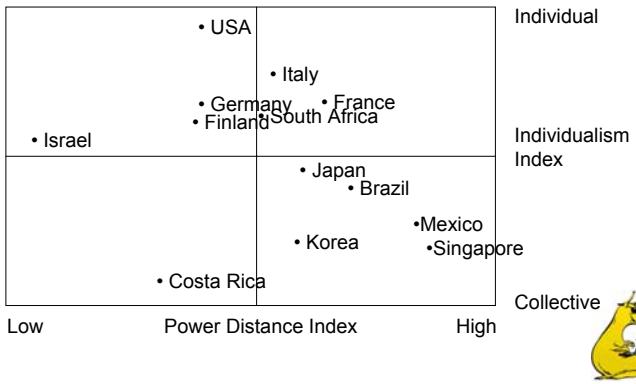
Culture vs. UI: Individualism vs. Collectivism

- Metaphors
  - **Individualist:** Action-oriented, tools
  - **Collectivist:** Relationship-oriented
- Mental Models
  - **Individualist:** Product- or task-oriented
  - **Collectivist:** Role-oriented
- Navigation
  - **Individualist:** Individual paths; popular choices, celebrity choices; stable across roles; customizable
  - **Collectivist:** Group-oriented, official choices; changes per role

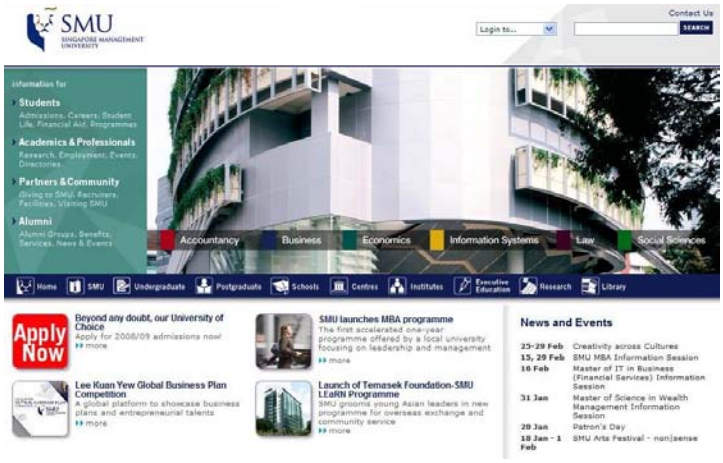
Culture vs. UI: Individualism vs. Collectivism

- Interaction
  - **Individualist:** Keyword searches; active-oriented; multiple devices; customizable;
  - **Collectivist:** Limited, official devices; role driven
- Appearance
  - **Individualist:** Images of products, people; low context; hyperbolic, dynamic speech; market-driven topics, imagery, language; customizable; direct, active verbs
  - **Collectivist:** Images of groups, organizations; images of roles; high context; official, static terminology; institution-driven topics, imagery, language; passive verbs

Power Distance vs. Individualism-Collectivism



Singapore Management University



Tel Aviv University

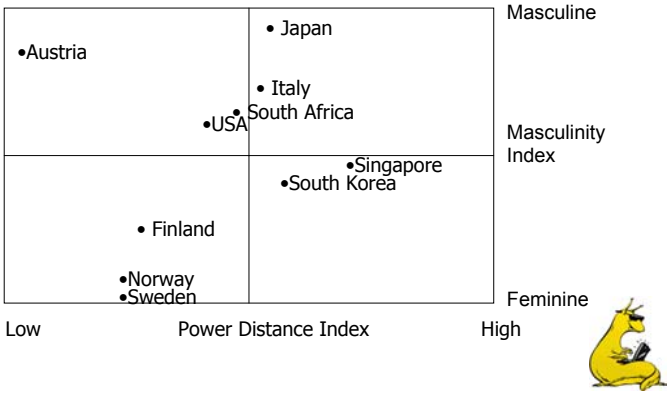
Culture vs. UI: Masculinity vs. Femininity

- Metaphors
  - **Masculine:** Sports-oriented; competition-oriented; work-oriented
  - **Feminine:**Shopping carts; family-oriented
- Mental Models
  - **Masculine:** Work/business structures; high-level, "executive views;" goal-oriented
  - **Feminine:** Social structures; detailed views; relationship-oriented
- Navigation
  - **Masculine:** Limited choices, synchronic
  - **Feminine:** Multiple choices; multi-tasking, polychronic

Culture vs. UI: Masculinity vs. Femininity

- Interaction
  - **Masculine:** Game-oriented; mastery-oriented; individual-oriented
  - **Feminine:** Practical, function-oriented; co-operation-oriented; team oriented
- Appearance
  - **Masculine:** "Masculine" colors, shapes, sounds
  - **Feminine:** "Feminine" colors, shapes, sounds; acceptance of cuteness

Power Distance vs. Masculinity



NHK – Japanese TV

Norwegian TV

Culture vs. UI: Uncertainty Avoidance

- Metaphors
  - **High:** Familiar, clear references to daily life; representation
  - **Low:** Novel, unusual references; abstraction
- Mental Models
  - **High:** Simple, clear articulation; limited choices; binary logic
  - **Low:** Tolerance for ambiguousness, complexity; fuzzy logic
- Navigation
  - **High:** Limited options; simple, limited controls
  - **Low:** Multiple options; varying, complex controls

Culture vs. UI: Uncertainty Avoidance

- Interaction
  - **High:** Precise, complete, detailed input and feedback of status
  - **Low:** General, limited, or ambiguous input and feedback of status
- Appearance
  - **High:** Simple, clear, consistent imagery, terminology, sounds; highly redundant coding
  - **Low:** Varied, ambiguous, less consistent imagery, terminology, sounds

Wagamama: only noodle

Giraffe: Food from around the world

Culture vs. UI: Long-Term Orientation

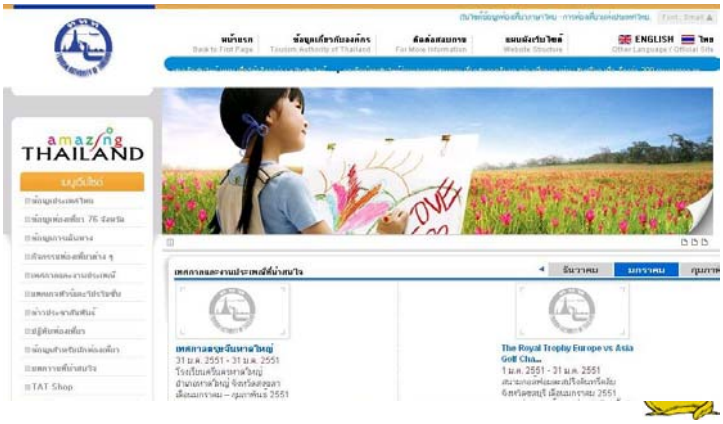
- Metaphors
  - **Long:** Stable family, Father; Mafia, IBM in 1950s
  - **Short:** Interchangeable roles, jobs, objects
- Mental Models
  - **Long:** Love/devotion; social coherence, responsibility, support
  - **Short:** Liberty; social incoherence/irresponsibility, efficiency
- Navigation
  - **Long:** Tolerance for long paths, ambiguity; contemplation-oriented
  - **Short:** Bread-crumb trails, taxonomies; quick-results; action-oriented

Culture vs. UI: Long-Term Orientation

- Interaction
  - **Long:** Preference for face-to-face communication, harmony; personalized messages; more links to people; live chats; interaction as "asking"
  - **Short:** Distance communication accepted as more efficient; anonymous messages tolerated; conflict encouraged; performance critical communication
- Appearance
  - **Long:** Cultural markers: flags, colors, atonal images; soft focus; warm, fuzzy images; pictures of groups inviting participation, suggestions of intimacy and close social distance
  - **Short:** Minimal and focused images; short borders, lines, edges; concentration on showing product

Moscow Tourism

Thailand Tourism



Ability Differences: We're all disabled

- When?
  - Environment: in a foreign country, in a bouncing vehicle, in the dark
  - Non-optimal health: lack of sleep, drunk, fever
  - Injury: hit a finger with a hammer
  - At the two extremes of our lives
  - Changing role of information technology: new products, unfamiliar interface
- Disability conditions:
  - Transient: Noisy room
  - Temporary: Broken arm
  - Permanent: For most, this one is labeled a disability

People with no useful vision

- Do not use a mouse
- Relay on audio equivalence to understand content → but how do you present layout?
- Braille signs are provided to present information where audio is unavailable (but only 10% blind persons read Braille)

- ➢All content must be accessible from keyboard only
- ➢Images, photos and graphics are unusable without meaningful description (so just putting ALT tag is not really a remedy)
- ➢Colors are unusable
- ➢Navigation may be difficult / confusing as many are based on 2D model
- ➢Varies on whether they're congenitally blind or not

People with limited cognition

- Users may have difficulty focusing on or comprehending sections of text
- Complex layouts or inconsistent navigational schemes may be confusing
- May need content in >1 form
- Animated images and other irrelevant information distract from main information (for those with ADHD, children, older persons)

- ➢Simplify the layout as much as possible
- ➢Provide clear and consistent site navigation
- ➢Organize information into manageable "chunks"
- ➢Use icons, illustrations, arrows, audio, video or other multimedia to enhance textual information

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.
  - Americans with Disabilities Act (ADA)
  - Section 508
- EU and W3C have declarations and guidelines on ensuring that everyone can get access to information that is delivered through software technologies (EuroAccessibility initiatives, WCAG)

Exclusions

- Physical
  - Inappropriate siting of equipment
  - Input and output devices making excessive demands on user abilities.
- Conceptual
  - complicated instructions or obscure commands
  - users cannot form a clear mental model of the system.
- Economical
  - people cannot afford some essential technology.
- Social
  - equipment is unavailable at an appropriate time and place
- Cultural
  - making inappropriate assumptions about how people work and organize their lives

Overcoming barriers to access

- Two main approaches:
  - Universal/inclusive design
  - Assistive technology
- Universal design
  - goes beyond the design of interactive systems and applies to all design endeavours.
  - grounded in a certain philosophical approach to design encapsulated by an international design community
  - if a design works well for people with disabilities, it works better for everyone
- Inclusive design is more pragmatic → doesn't claim to cover the whole population

Principles of Universal Design

1. Equitable Use: The design does not disadvantage or stigmatize any group of users.
2. Flexibility in Use: The design accommodates a wide range of individual preferences and abilities.

Principles of Universal Design

3. Simple, 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.

Principles of Universal Design

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.

Principles of Universal Design

7. 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.

Assistive Technology

- Technology designed to be utilised in device or service to increase, maintain, or improve functional capabilities of individuals with disabilities
- Provide user with alternative technology to operate the system
  - allowing them to operate the system through an alternative interface (e.g. input device).
  - allowing them to modify some parts of the system.

Accessible technology	Assistive technology
Convenient (doesn't require people to own additional device)	Necessary for people with multiple disabilities
Removes the stigma of special aids	Sometimes more commercially/ practically viable

Assistive technologies

- Screen readers to read application content
- 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.
- Assistive listening devices, TTY/TDD, and visual alerting systems
- Augmentative or Alternative Communication (AAC) devices
- Text summarization software
- Color adjuster/overlay (for people with dyslexia)

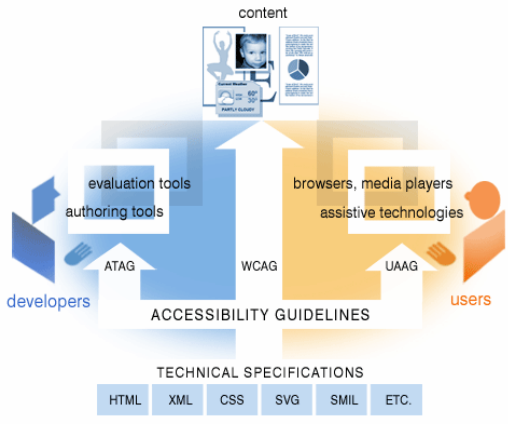
"Section 508"

- Section 508 of the Rehabilitation Act Amendments of 1998
  - Apply to Electronics and Information Technology procured, developed, used, maintained by Federal departments and agencies
  - unless doing so would pose an undue burden on the federal department or agency
- Types of products covered by section 508 include:
  - Software applications and operating systems
  - Web based information or applications
  - Telecommunications functions
  - Video or multi-media products
  - Self contained closed products
  - Computers

"Section 508"

- Sample standards for software systems and OS
  - Product functions shall be executable from a keyboard
  - Applications shall not disrupt or disable activated accessibility features
  - Sufficient information about a user interface element including the identity, operation and state of the element shall be available to assistive technology
  - Applications shall not override user selected contrast and color selections and other individual display attributes
  - When animation is displayed, the information shall be displayable in at least one non-animated presentation mode at the option of the user
  - Software shall not use flashing or blinking text, objects, or other elements having a flash or blink frequency of 2<f<55 Hz

Accessibility : The Bigger Picture



W3C WAI WCAG

- World Wide Web Consortium (W3C)
  - Web Accessibility Initiative (WAI)'s Web Content Accessibility Guidelines (WCAG)
  - Themes of Accessible Design:
  - Graceful Transformation
  - Making Content Understandable and Navigable
  - WCAG 1.0 is almost obsolete but ties with many regulations (Section 508 Web part is correlated to this)
- There are (free) tools to check web accessibility at the code level (e.g. http://webxact.watchfire.com/).
  - But because WCAG is a technical spec, a manual check is still necessary

W3C WAI WCAG

- 14 guidelines. Each has:
  - The guideline number and statement.
  - The rationale behind the guideline and some groups of users who benefit from it.
  - A list of checkpoint, specific enough for verification, with priority levels:
    - Priority One – Must be followed or it is impossible for 1 or more groups to access info in the doc (A-level compliance).
    - Priority Two – Should be followed. Satisfying it will remove significant barriers for 1 or more groups (AA-level).
    - Priority Three – May be addressed. Satisfying it will improve access (AAA-level).

WCAG 1.0

1. Provide equivalent alternatives to auditory and visual content.
   - ALT text for images, captions for audio/video files, audio for text.
2. Don't rely on colour alone.
   - Flexible selection for background/foreground colours
   - Ensure presentation in colour is visible in BW

City	Temperature	Date	Old Record
London	35	July 21	34
Dundee	28	July 21	27
Cardiff	30	July 21	33

Cities highlighted in blue have a record high today

WCAG 1.0

3. If using markup and style sheets[1], do so properly.
   - Don't misuse codes (e.g. blockquote, heading)
4. Clarify natural language usage.
   - Specifying language helps multilingual screen readers
5. Ensure user control of time-sensitive content changes.
   - Ensure that moving, blinking, scrolling, or auto-updating objects or pages may be paused or stopped → *flashing text can be a trigger for photosensitive epilepsy; moving text is a distracter for people with ADD.*

[1]defines style (e.g., fonts, spacing, and aural cues) to HTML documents.

WCAG 1.0

6. Create tables that transform gracefully.
   - For data tables, identify row and column headers
   - Do not use tables for layout unless the it makes sense when linearized

Curriculum Vitae 1	
Name: 2	John Doe 3
Date of Birth:	1-Jan-1980
Education:	MSc. Computation
Qualification:	MSEE certified
Last updated on 18 Jan 2003 4	

Column heads should be not be coded as table heads

City 1	Temp 2	3 Old Record
London	35	34
Dundee	28	27
Cardiff	30	33
4	5	6

Column heads should be coded as table heads

Table should make sense when cells are followed sequentially

WCAG 1.0

7. Ensure that pages featuring new technologies transform gracefully.
   - Ensure that equivalents for dynamic content are updated when the dynamic content changes
   - Ensure that pages are usable when scripts, applets, other programmatic objects or style sheets are turned off or not supported
8. Ensure direct accessibility of embedded user interfaces.
   - Ensure that the user interface follows principles of accessible design: device-independent access to functionality, keyboard operability, self-voicing, etc

WCAG 1.0

9. Design for device-independence.
   - Use features that enable activation of page elements via a variety of input devices
10. Use interim solutions
   - Avoid popping windows if possible
   - Provide solutions so that assistive technologies and older browsers will operate correctly
11. Use W3C technologies and guidelines.
   - Use W3C guidelines to create an accessible page or provide an accessible alternative

WCAG 1.0

12. Provide context and orientation information.
   - Title each frame and how frames link to each other
   - Group information whenever possible
   - Myth: "Frames are inaccessible"
   - Advantages of frames:
     - Easy to navigate if identified correctly
     - Users may appreciate inherent grouping of content within frames
   - Disadvantages of frames:
     - Not supported by all browsers (use NoFrames tag)
     - Confusing if not identified correctly within the code

WCAG 1.0

- 13. Provide clear navigation mechanisms.
   - Provide site map, TOC, clear link's target, search functions for different abilities
- 14. Ensure that documents are clear and simple.
   - Use clearest and simplest language as possible
   - Consistent presentation style across pages

Example of Checkpoints

- Guideline 2. Don't rely on color alone.

  2.1 Ensure that all information conveyed with color is also available without color, for example from context or markup. [Priority 1]

  2.2 Ensure that foreground and background color combinations provide sufficient contrast when viewed by someone having color deficits or when viewed on a black and white screen. [Priority 2 for images, Priority 3 for text].

WCAG 2.0

- Not yet out but almost
- Technology-agnostic
   - *not* HTML dos and don'ts
   - Non tech-specific terminology = generic terminology
- 4 basic design Principles
   - Content must be Perceivable
   - Interface components in the content must be Operable
   - Content and controls must be Understandable
   - Content should be Robust enough to work with current and future user agents (including assistive technologies)
- 13 Guidelines
- Testable success criteria

WCAG 2.0

- Baselines
   - Mechanism to define technologies that are supported to make content and functionality accessible
   - Need to list Markup/programming languages, Style sheets, API etc.
- Scoping
   - "This part of the site is not accessible, we're not claiming it is …"
- Conformance statements (level 1 - minimum, 2 - enhanced or 3 - additional), based on:
   - The baseline technology that's agreed
   - The sections of the site that are included

WCAG 2.0

- Example: 1 Level 1 requirement
  - Principle 2: Interface components in the content must be Operable
  - Guideline 2.5 Help users avoid mistakes and make it easy to correct mistakes that do occur
  - Success Criteria 2.5.1 If an input error is detected, the error is identified and described to the user in text
- Criticism on the language and jargons used
- Criticism on the procedure – to make a conformance claim:
  - The date of the claim, the URI of the guidelines
  - The conformance level, the baseline and scope

Manual Test for Accessibility

- Turn off graphics
- Turn off sound
- Turn off style sheets
- Choose "high contrast" option
- Use largest font size
- Re-size browser window
- Navigate using keyboard
- Select all text and copy into clipbоard, paste elsewhere
- Use a specialized browser or analysis tools

Ensuring an inclusive system

- Include people with special needs in requirements analysis and testing of existing systems → build personas and scenarios that include assistive technology use
- 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 alpha/beta tests.

If you do work with participants

- Research oversight[1] is needed
  - Too many clinical trial blunders
  - The future impact of such issues as cloning, gene therapy, genetic engineering, etc. is unknown.
- History: Nuremberg Code
  - Informed consent is essential.
  - Research should be based on prior animal work.
  - The risks should be justified by the anticipated benefits.
  - Only qualified scientists must conduct research.
  - Physical and mental suffering must be avoided.
  - Research in which death or disabling injury is expected should not be conducted.

[1]a system for addressing questions of potential risk through guidelines, regulations or other structures

If you do work with participants

- History: Declaration of Helsinki (1964)
  - Nuremberg Code + medical research with therapeutic intent (World Medical Association)
- History: National Research Act of 1974
  - Established "National Commission for the Protection of Human Subjects of Biomedical and Behavioral Research"
  - Required establishment of IRBs at institutions receiving the Department of Health and Human Services funding for human subjects research
- History: Belmont Report (1979) – Govt of USA
  - Established the basis for the ethical principles upon which federal regulations for protection of human subjects are based

The Institutional Review Board

- Mandated for all institutions conducting human research.
  - Any study intended to result in publication or public presentation, including classroom projects.
  - Any activity resulting in publication or public presentation, even if it involves only review of existing data that was collected with no intent to publish.
  - Any use of an investigational drug or device.
- Exempt → non research
  - Employee evaluation, program evaluation, quality assurance, or other situations where such evaluation is not designed to lead to generalizable knowledge

The Institutional Review Board

- Roles and responsibility.
  - Review research plan to be sure it meets criteria in Federal regulations
  - Confirm there are no unreasonable risks
  - Conduct continuing review
  - Assess suspected or alleged protocol violations.
- Authority
  - Approve, disapprove, or terminate all research.
  - Require modifications to protocols.
  - Require that information the IRB deems necessary is provided to participants.
  - Require documentation of informed consent, or allow waiver of consent.

Types of IRB Review

- Full board review
  - For research involving risk of physical or psychological harm greater than that encountered in daily life, particularly research involving deception, stress, or manipulation
- Expedited review
  - Collection of data through noninvasive procedures, such as weight, blood pressure, flexibility testing, etc)
  - Materials (data, documents, records, or specimens) that are collected solely for non-research purposes.
- Administrative review
  - Research conducted in accepted educational settings
  - Research involving only observation of public behavior
  - Research involving only surveys or interviews

What to submit to IRB

- Protocol statement (What is to be done.)
- Consent forms OR
- Assent forms (for children 7-17 years old)
- All personnel involved and their qualifications
- Location for study
- Special populations, if any
- Data collection method – a copy of the questions might be needed
- Recruitment ads
- Source of funding
- Payment to subjects
- Costs to subjects
- Benefits to subjects
- Risks and discomforts
- Confidentiality – how confidentiality will be maintained for records, videotapes, audiotapes, and how records will be destroyed at end of study.

UCD with Participants with Special Needs - Recruitment

- Add recruiting time and expenses
- Make key contacts
- Check ethical issues
- Conduct pilot tests early
- Plan higher expenses (transport cost, a carer, etc)
- Consider their needs (wheelchair access, blind-friendly environment, etc)
- Plan time for participants to become comfortable and familiar with the environment
- Be ready to do some studies at participants' home
- Make sure all materials are available in necessary formats.

Preparing the Session

- Include consent forms with the materials sent ahead of time
- Use a checklist to ensure that you have anticipated any potential barriers → evaluate the accessibility of potential locations
- Schedule a walkthrough by a person with similar accessibility needs
- Be familiar with the Assistive Technology the participants need to use → Schedule time to set up and test AT
- Make sure everybody involved in the session are properly trained on issues associated with dealing with persons with special needs → training can take a while

At the Session

- Don't make assumptions
- Ask before you help
- Speak normally unless requested otherwise
- Use "people-first" language ("a person with wheelchair" rather than "a wheelchair-bound person")
- Avoid potentially offensive terms or euphemisms
- Be aware of personal space
- Don't interact with a service animal
- Don't act like a carer
- Consider how you would introduce yourself and explain the protocol to the participants

Specific Consideration for Participants who are Blind and VI

- Introduce yourself as you approach the participant
- Introduce others who are in the room.
- Describe the setting to the participant, including the position of the video camera.
- Tell the participant when you or others enter or leave the room.
- Give directions about where to be seated. Ask the participant if he or she would like to be guided to the chair.
- Offer your elbow to lead the participant. Don't grab the participant's arm, hand, or cane.
- Tell the participant where there is room for the service animal.

Specific Consideration for People who are deaf or HI

- Get the participant's attention before talking. Touch the person gently on the shoulder or arm.
- Take turns talking. A person who speechreads might miss information if two or more people talk at the same time.
- Face the participant while speaking, and speak at eye level.
- Clarify to the interpreter the importance of translating questions and answers exactly.
- Don't speak too loud. Some hearing aid and cochlear implant users are especially sensitive to loudness.
- Offer to write down what you are saying

Specific Consideration for People with Physical Impairments

- Do not move mobility aids. Some people are uncomfortable if the aids are out of reach.
- Remember seating for a personal attendant.
- Have a clipboard available to hold the consent form and instruction sheet.
- Remember space for a wheelchair, a cane or other mobility aids.

Specific Consideration for Children

- Arrange furniture so that children are not directly facing the video camera and one-way mirror
- Timetable a session of max 1 hr (30 min for pre-schoolers) and integrate play in breaks
- Check whether you need parents to sign consent form
- Children up to 7 or 8-years-old will need a tester in the room with them for reassurance.
- If a parent will be present in the room, explain to the parent to minimise interaction with her children
- Use phrases such as "Now I need you to…" or "Let's do this…" or "It's time to…"

Preferred Terms

- Person (with a) or (has sustained) or (with and acquired) brain injury
- Person with hearing loss/hard of hearing or, who is deaf– they are different (and definitely not 'the deaf')
- Person [living] with AIDS/HIV
- Down syndrome NOT 'mongoloids'
- Cleft lip NOT 'hare lip'
- Non-disabled NOT 'normal', 'able-bodied' or 'healthy'
- Stroke survivor NOT 'stroke victim'
- People with disabilities NOT 'the disabled' or 'handicapped people'
- Mature or older person NOT 'the elderly'
- Person with epilepsy or seizure disorder NOT 'epileptic'