CS5340
Human-Computer Interaction

January 24, 2013

Today's Class

- Administrivia
- Ethnography
- T2/I2 assignment
- Ethnography exercise (?)
- Interaction Models
- User-centered Design

Administrivia

Project Notes

- The idea you think you have may very well change – and should change
- Need to be focused on the problem area at this stage
  - **not** specific technology concepts
  - **not** specific application features

Assignment Due Dates

- T2/I2
  - Due in 2 weeks: 2/7
- Most other assignments bumped back a week

Ethnography

Epistemology

- Branch of philosophy concerned with the grounds and nature of knowledge
- How can we know about the world?
- What does the theory of knowledge have to do with me?
  - HCI is largely empirical
  - Must understand different perspectives on how knowledge can be obtained
- 2 broad positions
  - Positivism, Anti-positivism (interpretivism)

Positivism

- Derived from natural sciences
- Search for **objective** "laws" or "facts"
  - Attempts to explain the world e.g. gravity
  - Scientific method, hypothesis testing, experiments
  - Social world operates like physical world
  - Developing the "laws" that govern human action and interaction
- HCI – what have we learned about that fits this perspective?
  - Fitt's Law (predictive model of movement time)
  - Memory capacity (7+-2 chunks in STM)

Anti-Positivism

- Aka interpretivism
  - Truth is not absolute, but decided by human judgment
- About understanding "meaning" of action from actors perspective
- A reaction to positivism
  - Asks and answers different types of questions
- Often employs qualitative methods
  - Because of their desire to gather data about experience from the perspective of those experiencing the phenomenon

Quantitative & Qualitative

- Quantitative Methods
  - Strongly support collection of positivist-oriented data
  - Measurement
  - producing numerical data about trends (with confidence)
  - Tell us **what** people do, and **that** they do it
  - E.g., experiments
- Qualitative Methods
  - Strongly support the collection of interpretivist-oriented data
  - Descriptive (words, pictures, etc.)
  - Understanding **how** people think, the **whys of** behavior
  - E.g., ethnography

Quantitative & Qualitative

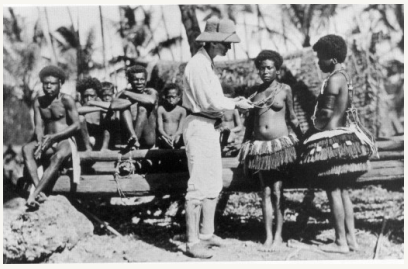
- Qualitative and Quantitative independent of epistemology
- Can pursue interpretivist questions quantitatively
  - Some analytic techniques make numeric results from qualitatively collected data

Ethnography

- The art and science of describing a group or culture.
- Approach to data gathering & analysis
  - Interpretivist: understanding meaning from perspective of people studied ("emic")
  - Sociology + Anthropology
- Purpose: to become intimately familiar with a way of life by living it

Ethnography

- Bronislaw Malinowski, 1915
  - Catalyzed fieldwork in anthropology
  - People can't always tell you what they do.
  - Need to get beyond the office, and see firsthand
  - Naturalistic inquiry
  - To make authoritative claims about a culture you must have been there, done that.



Ethnography in HCI

- Desire to go beyond positivist methods
  - Predictive models
  - Experimental lab testing
  - As in social sciences, desire to go "in the wild"
- Understand potential end users
  - Prior to introducing systems
  - After introducing new systems
- Many approaches to ethnography
  - Informed by sociology, cognitive science, etc.

Ethnography

- So what is it?
- The art and science of describing a group or culture.
- How different from news reporter?
  - Reporters: seeks out the unusual
  - Ethnography: usual, routine lives of people
- How similar to news reporter?
  - Bias
  - Goal is to communicate what's been seen to others
  - Outsider status

Ethnography

- As ethnographers, must…
  - Be open minded
  - Avoid method in search of problem
  - Conduct research in native environment
- Difficult!

Ethnography

- What it involves
  - Studying a group (fieldwork)
  - Documenting what's seen (field notes)
  - Interpreting what's been seen (analysis)
- Goal: a holistic account of what's been seen
  - For HCI…
    - a rich account of context, behaviors, values, desires, etc.
    - Identification of opportunities to (not) design

Fieldwork Methods

- Observation
  - Participant (full immersion, engagement)
    - Challenge: "going native"
  - Non-participant (outsider looking in)
- Interviews
  - Structured
  - Semi-structured
  - Unstructured

Observations

- Watching & documenting
  - Activities
  - Behaviors
  - Settings
  - Actions
  - Conversations
  - Interpersonal interactions
  - Organizational or community processes
  - *Observable human experience*
- Data consists of fieldnotes that are
  - Rich, detailed descriptions

Observations

- How do I know what to look for?
  - Remember Stimuli + Attention?
  - Must choose what to attend to
  - Initially, be very open
  - Focus based on
    - particular questions of interest
    - Things that capture your attention in initial observations
- Defamiliarization?

Participant Observation

- Join the observed in their activities
- Attempts to get "insider" view
- Take notes (jottings)
- Unstructured, informal interviewing

Meals & Technology

What is the nature of mealtime and how is technology currently mediating it?



Meals & Technology

I attended the Sunday late afternoon dinner of this family at their home. The dinner was supposed to start at 4pm, which is kind of an odd time to eat.

However, it kind of makes sense given that I'm assuming they attend church. I think that Sunday meals are often at strange times of the day.

The kids had their own table which was separated from the "grown-up" table by the kitchen. The kid's table was very close to the TV which was in the den.

Meals & Technology

The TV is on in the den but we can hear it from where we are sitting at dinner. I sit down at the grown up table, across from F1 and with Dad to my left.

Most of the grown up's plates were pretty loaded up with food.

I notice that Dad has the earpiece from his cell phone attached to his shirt throughout dinner.

Meals & Technology

The topics of discussion are lively and substantive! That is, it's not just small talk, they're actually talking about major issues (outsourcing, unemployment, etc.) [Is this normal?]

The friend's cell phone rings. She goes into the living room and answers it. We can hear her conversation in the dining room.

Non-Participant Observation

- Sometimes you can not participate
  - E.g., Safety-critical contexts
- You watch people doing what they do
  - This is quite challenging
  - Confusing, boring, as well as interesting
  - May be off-putting to observed

Community Mosaic

Community Mosaic

It's 6pm and the Y in general is not very busy right now. One young AA male went up to the Y, intrigued, pressed "hoped" button. Its seems like he pressed it more to see what it does than to actually express a feeling.

One person's reaction to a message: "I do that too" (the YMCA youth teacher). He also asked "where is this" when looking at a picture. He doesn't like pictures without text, saying, "if I wanted to go get this I wouldn't know where it was".

Community Mosaic

Someone else sees the open window and slows down to look but doesn't interact. That seems helpful though, when the window is open the content is in their face and it's more clear what the display is all about.

A mother scolds her son for touching the display (he seems like he's about 7 years old).

Fieldnotes

- Descriptive
  - What happened
  - From their perspective
- Analytic
  - Your interpretations of what happened
- Methodological
  - What worked, what didn't
- Don't delay
  - Write notes as soon as possible so as not to lose vivid details

Fieldnotes

- Jottings
  - Brief observations
  - Shorthand
  - Sentence fragments
- Full Field Notes
  - Flesh out jottings + other memories
  - Prose
  - Full sentences
  - Vivid, detailed

Fieldnotes

- Watching & documenting
  - Activities
  - Behaviors
  - Settings
  - Actions
  - Conversations
  - Interpersonal interactions
  - Organizational or community processes
  - *Observable human experience*

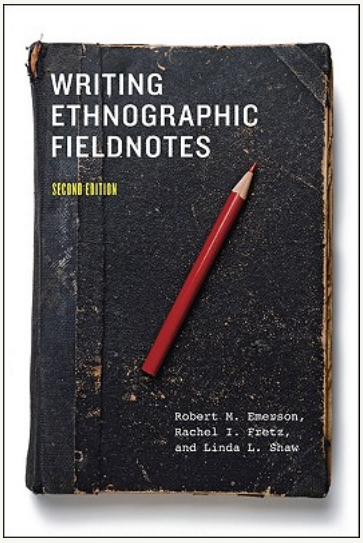
Fieldnotes

- Categories of things to write about
  - **Type** (what is this an instance of, what kind of experience)
    - E.g., "Sunday meals"
  - **Frequency** (how often is something happening)
    - "answered phone twice"
  - **Magnitude** (size, intensity, strength)
    - "large portions", "small gathering"

Fieldnotes

- Categories of things to write about
  - **Structure** (arrangement of groups, interaction)
    - "adults sat together, kids separately"
  - **Process** (how did something happen)
    - "deep conversations right as meal began"
  - **Causes & Consequences** (circumstances leading to & following event)
    - "the child tried to touch the display, so mother scolded"

More…



Interviews

- Structured
  - Stick to the Interview Guide
  - Know what you want answered (be careful)
- Semi-structured
  - Interview guide, but deviation encouraged
  - Somewhat know what you want answered
- Unstructured
  - No guide, based on interactions, conversational
  - Unsure what will be of interest

Interviews

- Types
  - 1-on-1
  - Group (focus group)

Interview Elements

- Types of questions
  - Grand-tour
    - "What were your overall impressions…"
    - Easily-answered questions
    - Get participant used to talking
    - Give you topics to follow-up on
  - Directed queries
    - about a topic that you pose initially
  - Prompts
    - Follow-up nudges
    - "You said X, what did you mean?"
  - Story
    - "Tell me about the last time you…" vs. "Do you ever…"

Interview Elements

- Types of questions
  - Grand-tour
    - "What were your overall impressions…"
    - Easily-answered questions
    - Get participant used to talking
    - Give you topics to follow-up on
  - Directed queries
    - about a topic that you pose initially
  - Prompts
    - Follow-up nudges
    - "You said X, what did you mean?"
    - Silence, Clarifying, Tell me more, Agreeing sounds

Avoid Leading

- Directing participant to say what you want to hear
  - They may do this anyway, be on guard
- Don't say
  - "Did you like using X feature?"
- Say
  - "What were your impressions of X feature"
  - "Anything you would change?"
  - "Anything you liked, if not that's fine…"

Interview Elements

- Types of questions
  - Story
    - "Tell me about the last time you…" vs. "Do you ever…"
  - Open-ended
  - Closed

Bias

- You are a research instrument
  - You collect data
  - Their experiences filtered through your mind
- So what to do?
  - Be explicit
    - about your assumptions, biases
    - about your process (method, analysis, etc.)
  - Triangulation
  - Member checking
  - Sampling

Critical Sensitivity

- To unique culture of environment
- To group's values
- To respect for person
- To person's time
  - Glances at watch
  - Looks
- To not talking, but listening
- To having person feel in control
- **You are there to learn from them**

Getting started

- Getting in
  - Best to have an advocate (gatekeeper)
  - Possible to do it if you don't
- Timeline
  - Best if long-term
  - Possible to learn from short exposure

Homework: T2/12

Due 2/7

- Goal: gain first-hand knowledge about your problem space
- As a team, choose a setting to observe
  - Based on T1 feedback
  - You must be resourceful (student groups, community organizations, etc.)
  - Must help you gain insight into topic area
  - This may affect your project topic (if so, see me)
- Each person: conduct 2.5 hours of observation
  - Of your target user group

Homework: T2/12

- Tasks
  - Choose location
  - Prior to heading out, talk as a team about what you expect to see
    - Surface biases
    - Identify questions that you hope to answer

Homework: T2/12

- Tasks cont.
  - **Independently,** conduct 2.5 hours of observation
    - **Do NOT** bring phone, computer, tablet etc.
    - Upon arrival, check in with someone in charge to let them know what you're doing
    - If they are not comfortable with you being there, **leave**
    - Make jottings (notes) about what you see
      - Activities, environment, interactions
    - Spend at least 30 minutes interviewing 2-3 people

Homework: T2/12

- Tasks cont.
  - Afterwards, create full field notes
    - Quick notes → prose, quotes
- **Each team member turns in own report**:
  - Jottings
  - Summary of why you chose this setting & questions you hoped to answer
  - Full field notes (w/quotes)
  - Implications for design (5 bullet points)

Homework: T2/12

- Carefully read T2 instructions on course website
- Keep an open mind!

Activity

- 10 minutes
- Go downstairs, observe lobby space
  - Create jottings
    - What are people doing?
    - How are they interacting?
    - Physical space
    - Opportunity for technological innovation?
- How would you redesign the space?

Activity

- In groups of about 6 (10 minutes)
  - Discuss what you saw
  - Similarities
  - Differences
  - Anything new observed or what you already knew?
  - Comfortable? Uncomfortable?
- 1 or 2 groups report back

Interaction Models

Modeling Interaction

- Models
  - Abstractions
  - Framework for understanding something
- Why do we do it?
  - Identify difficulties + successes
  - Compare different interaction styles
- Norman's execution-evaluation cycle
- Abowd & Beale

Terms of Interaction

- What are important concepts?

domain – the area of activity (work, leisure, etc.) under study
e.g. graphic design

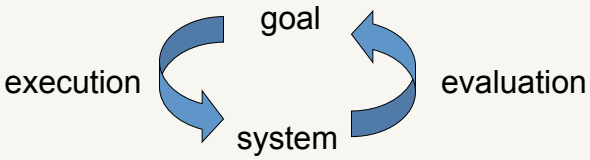
goal – what user wants to achieve
e.g. create a solid red triangle

task – how user goes about doing it
– ultimately in terms of operations or actions
e.g. … select fill tool, click over triangle

Donald Norman's model

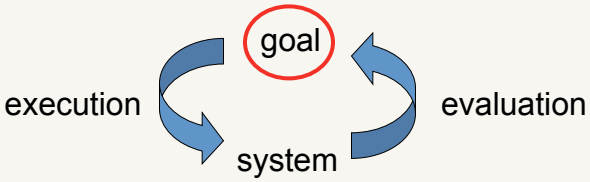
- Seven stages
  - user establishes the goal (imprecise, domain-specific)
  - formulates intention (more specific)
  - specifies actions at interface
  - executes action
  - perceives system state
  - interprets system state
  - evaluates system state with respect to goal
- Limitation?
  - user's view of the interface, but not system's role

Execution/evaluation loop



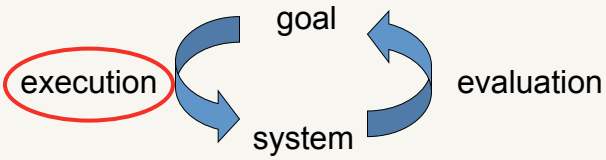
- user establishes the goal
- formulates intention
- specifies actions at interface
- executes action
- perceives system state
- interprets system state
- evaluates system state with respect to goal

EXECUTION/EVALUATION LOOP



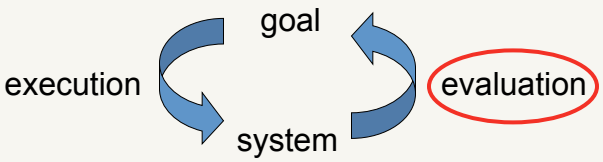
- user establishes the goal
- formulates intention
- specifies actions at interface
- executes action
- perceives system state
- interprets system state
- evaluates system state with respect to goal

EXECUTION/EVALUATION LOOP



- user establishes the goal
- formulates intention
- specifies actions at interface
- executes action
- perceives system state
- interprets system state
- evaluates system state with respect to goal

EXECUTION/EVALUATION LOOP



- user establishes the goal
- formulates intention
- specifies actions at interface
- executes action

- perceives system state
- interprets system state
- evaluates system state with respect to goal

USING NORMAN'S MODEL

Gulf of Execution

user's formulation of actions

≠ actions allowed by the system

How related to mental models?

Gulf of Evaluation

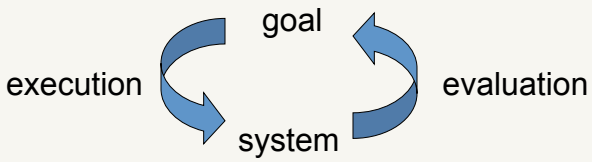
user's expectation of changed system state

≠ actual presentation of this state

Examples?

Slips & Mistakes

- Difference?



Human error - slips and mistakes

slip
- ☺ understand system and goal
- ☺ correct formulation of action
- ☹ incorrect action

mistake
- ☹ may not even have right goal!

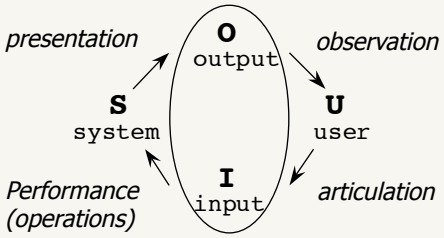
Implications?

slip – better interface design
mistake – better understanding of system

Abowd and Beale framework

extension of Norman…
4 parts

- user
- input
- system
- output



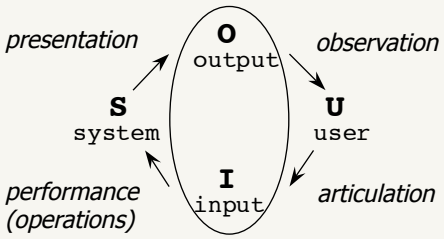
each has its own unique language

interaction ⇒ translation between languages

problems in interaction = problems in translation

Examples

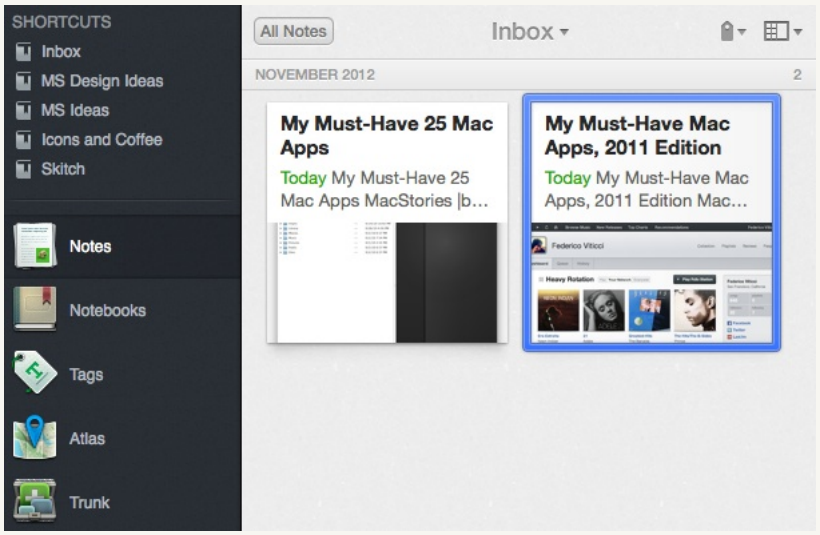
- Remote control
  - Performance stifled; input language only maps to subset of core language
- Room lights
  - Articulation stifled; unclear how to translate goals->input language
- Other systems that make transitions difficult and how would you improve?



Organizing controls

- Controls let you manipulate the system
  - E.g. menu items
- How can they be organized?
  - Functional
  - Sequential
  - Frequency
- Relationship to what we know about memory?
  - Semantic memory structures → organization helps us intuitively know where to locate controls
- Examples?

Evernote



Interaction Styles

- Command line
- Menu-driven
- Natural language
- Transaction-oriented forms
- Spreadsheets
- WIMP

Command line

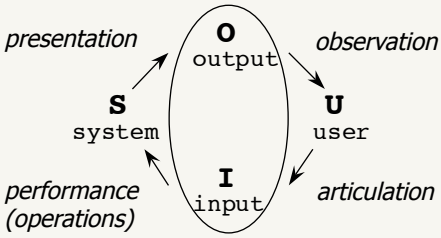
- Pros for supporting interactivity?
  - suitable for repetitive tasks
  - offers direct access to system functionality
  - Flexible (what does this mean?)
- Cons
  - better for expert users than novices
  - relies on memory

Natural Language

- Ideal (?)
- Challenging
  - Language is ambiguous (structure, semantically)
  - Computers require precise instructions
- Dix 2004: "... It seems unlikely that a general language interface will be available for some time"

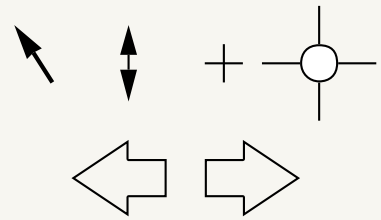
Natural Language

- Siri as an interface
  - Pros?
  - Limitations?



WIMP: Pointers

- Often used to indicate *modes*
  - (Be careful with modes ... Why?)

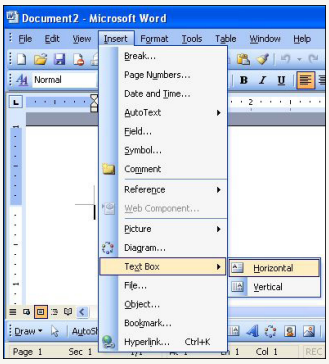


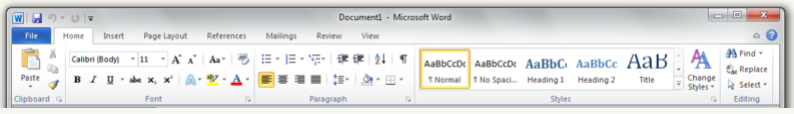
WIMP: Menus

- Presents a choice of operations available at a given time
  - Why is this useful?
    - Recognition is better than recall
- Too many items -> inefficient
  - Cascading menus
- Hierarchy – pros and cons?
  - Pro
    - can support grouping that matches user's semantic memory
    - Support efficient locating of information
  - Cons
    - If doesn't match mental model, challenging

Menus

- To consider
  - Organization
  - Prompting
  - Adaptive
  - Ribbon vs pull-down ... Your thoughts?



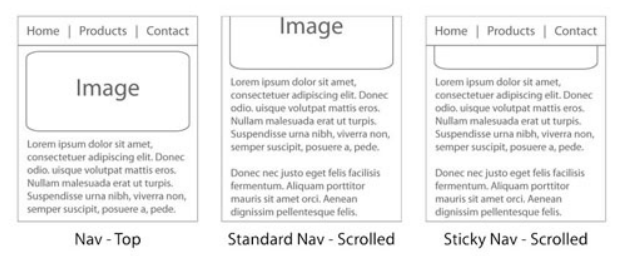


Touch

- Is WIMP dying? Is Touch "the future"?
- From an HCI standpoint, pros?
  - Even closer to direct manipulation vision
  - Mimics real world interaction
- Cons

Touch

- http://vimeo.com/4206140
  - Immediate access (quick taps, most important content easily accessible)
  - Leverage clear mental models (flicking, drags, physics)
  - Feedback is key



http://uxdesign.smashingmagazine.com/2012/09/11/sticky-menus-are-quicker-to-navigate/

Touch

- Liquidtext
- http://liquidtext.net/demos/
- Positive Aspects?
  - Direct Manipulation
  - Some natural (established conventions) gestures supported
  - Supports low-level tasks in context of bigger picture
  - Provides memory aids during document editing (notes to the side)
- Potential Challenges?
  - Recovering from error?
  - Learning various gestures, modes

Interactivity!

- The "feel" of an interface
  - How it behaves
- "When looking at an interface, it is easy to focus on the visually distinct parts (the buttons, menus, text areas) but the **dynamics**, the way they react to a user's actions, are less obvious"
- Every selection of every widget (and it's behavior) should be **deliberate**

Context!

- Social + physical environment effects interaction
- People and relationships
- Users must be motivated
  (fear, allegiance, ambition, self-satisfaction)
  (get feedback; not slow/buggy)
- Meet (job) expectations
- Or...
  - Rejected
  - Resented
  - Adapted

Engagement

- *Wanting*
- Beyond work – home, leisure, entertainment
- Responds to personal values
  E.g. Shopping
  - "not about an efficient financial transaction, it is an experience"

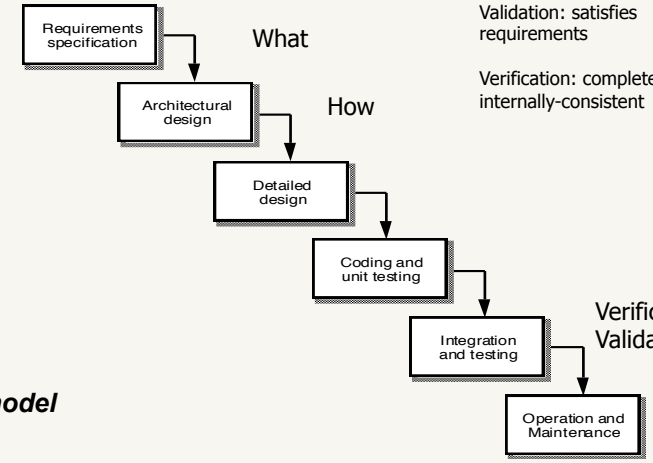
Engagement

- Understanding engagement
  - Flow ("in the zone")
    - "teetering at the edge of your abilities"
  - Zone of proximal development
    - Can't quite do yourself but can with help
    - Learning happens best here
  - *Technology as Experience*, McCarthy & Wright
    - Sensory activation (visceral, e.g., feel of a phone)
    - Emotion (satisfaction, fear, etc.)
    - Spatio-temporal (impact of time and place)

User-Centered Design

The Software Lifecycle

Customer vs. user



What

How

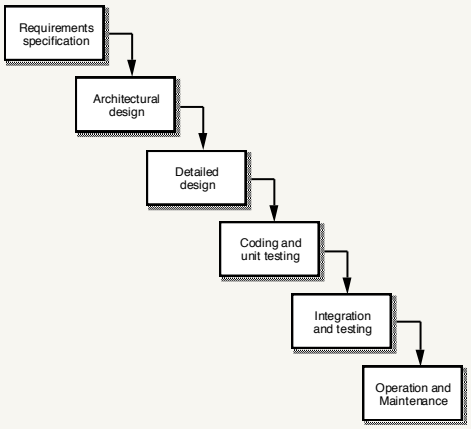
Validation: satisfies requirements

Verification: complete and internally-consistent

Verification v. Validation

The waterfall model

Why doesn't this work for UIs?

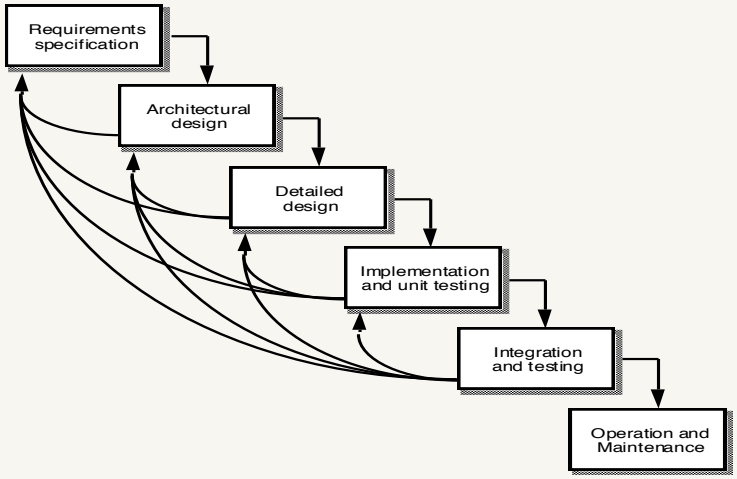


People are insanely complicated – models cannot fully predict how they will use systems (especially early).

Cannot determine all requirements from the start

(which results in 50% designer's time spent on code for UI)

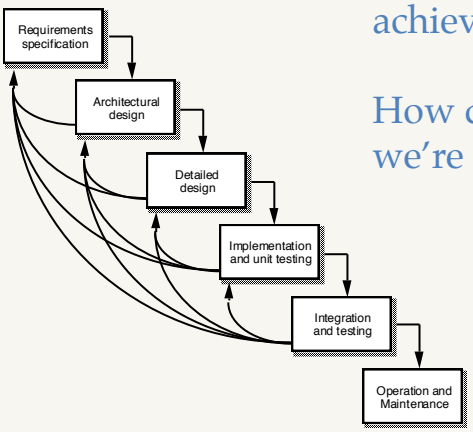
Lifecycle for UIs



User-Centered Design

- Try lots of ideas. See how users respond.
  - Involve representative users in all stages of the development process.
  - Minimize the cost of and commitment to prototypes.
  - Users often can't tell you which alternative is "better" – have to test, measure & observe.

Usability Engineering



The process by which we achieve system usability.

How do we know when we're there?

Usability Engineering

- Must define usability attributes (multi-dimensional)
- Must define specific measures for each
- Must define "good enough" (goal) levels for each
  - If appropriate, current & ideal levels for each

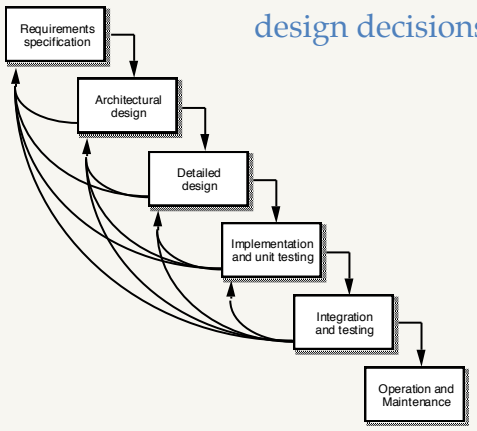
- Example attributes (measures?)
  - Learnability
  - Efficiency
  - Memorability
  - Low error rate
  - Subjectively pleasing

Usability Metrics

- See tables 6.1-6.4
- Limitations?
  - Very specific actions in specific situations
  - Doesn't answer whether satisfying metrics yields a sense of usability for user

Usability Engineering

How do we remember what we've tried/ learned before and why we made various design decisions?



Design Rationales
+ Decisions made
+ Alternatives investigated
+ Why certain alternatives chosen

Design Rationales

- Simplest version
  - Documenting major design decisions & rationale
- Benefits
  - Thinking through design trade-offs
  - Communication amongst team
  - Accountability for decisions made
  - Reuse of knowledge across products

Design Rationales

- Process-oriented
  - Captures chronological order of decision making
- Structure-oriented
  - Post-hoc description/re-creation of explored design space
  - Based on criteria, denotes which decisions were favorable/unfavorable
  - Abstracts away from details of process; useful for future design

Iterative Design

- Cycling through several designs
- Incrementally improving to reach final product
- Gathering user feedback throughout the process
- Prototyping approaches
  - Throw-away
  - Incremental (one component at a time)
  - Evolutionary (gradual refinement, building)

Iterative Design

- Beware of ...
  - Early commitment ... Design inertia may make it difficult to recover, even in the face of overwhelming evidence
  - Understand reasons for problems, not just detecting symptoms (and patching)

First Step: Requirements & Specifications

- Know your user
  - Knowledge about people in general (human factors)
  - Very, very specific knowledge about users and environment (ethnography)

To Do For Next Week

- Start T2/I2 (figure out observation site asap!)
- Read DFAB 13, 15; Preece (will post soon)
- Read Research Papers: Health Interfaces #1: Social
- Presentations
  - Yang Huang
  - Yucheng Huang
  - Cherry Kedia
  - **Practice**! Presentation Template on course website