Iterative Design Process

- Requirements analysis
- Preliminary and detailed design
- Implementation
- Evaluation
Requirements Analysis

- Determining requirements for interaction design from stakeholders
  - **Functional requirements**
    - Behavior the system should support
    - “What” the system should do
  - **Non-functional requirements**
    - The way in which functional requirements should be supported
    - “How” the system should do it: Hdw, sfw, usability, performance, reliability, supportability
  - **User experience requirements**
    - Non-functional requirements specifically related to the UI

Preliminary and detailed design

- Preliminary design (architectural design, conceptual design)
  - Determining high-level concepts
    - User’s mental model
    - UI appearance, navigation, interaction
  - Detailed design
    -Specifying the user dialogue
    - UI appearance, navigation, interaction
- Methods: Sketching, Prototyping
Implementation

- Turning the design into a running system (hardware and software)
- For us
  - HTML, CSS, JavaScript, libraries
  - IDEs/Editors

Evaluation

- Determining how well the design meets requirements at any stage
  - Heuristic evaluation
  - User studies
Sketching


http://sketchbook.cpsc.ucalgary.ca/

Sketching

- Getting the design right vs. getting the right design
- “There is surely nothing quite so useless as doing with great efficiency that which should not be done at all”
  —Peter Drucker, Managing for Business Effectiveness, 1963
- “Efficiency is doing the things right. Effectiveness is doing the right things.”
  —Peter Drucker
Properties of Sketches

- Quick
- Timely
- Inexpensive
- Disposable
- Plentiful
- Clear vocabulary
- Distinct gesture
- Minimal detail
- Appropriate degree of refinement
- Suggest and explore rather than confirm
- Ambiguity

— Buxton, Sketching User Experiences

Properties of Sketches

“The ceramics teacher announced on opening day that he was dividing the class into two groups. All those on the left side of the studio, he said, would be graded solely on the quantity of work they produced, all those on the right solely on its quality. His procedure was simple: on the final day of class he would bring in his bathroom scales and weigh the work of the “quantity” group: fifty pounds of pots rated an “A”, forty pounds a “B”, and so on. Those being graded on “quality,” however, needed to produce only one pot—albeit a perfect one—to get an “A.” Well, came grading time and a curious fact emerged: the works of highest quality were all produced by the group being graded for quantity. It seems that while the “quantity” group was busily churning out piles of work—and learning from their mistakes—the “quality” group had sat theorizing about perfection, and in the end had little more to show for their efforts than grandiose theories and a pile of dead clay.” (Bayles & Orland 2001; p. 29)

— Buxton, Sketching User Experiences
Sketching

Elaboration
(opportunity-seeking: from singular to multiple)

Starting point

Design Process

— Buxton, Sketching User Experiences

Sketching

Reduction
(decision-making: from broad to specific)

Design Process

Focal point

— Buxton, Sketching User Experiences
Sketching

P. Laseau, Graphic Thinking for Architects and Designers, 1980

Sketching — Buxton, Sketching User Experiences

S. Pugh, Total Design: Integrated Methods for Successful Product Engineering, 1990

The Design Funnel

Front-end Design Work

PDS = Product Design Specification

Concept Generation

CC = Controlled Convergence

CG = Concept Generation

The initial number reduced

New area added

Further reduction

Further evaluation

FR

FA

Concept Selected

Buxton, Sketching User Experiences
Discount Usability Engineering
J. Nielsen

- Cost-cutting approach to evaluating usability “on the cheap”
  - Use lo-fi approaches
  - Sacrifice statistical significance (e.g., fewer participants)

- Ingredients
  - Scenarios reduce complexity
    - Horizontal prototype: Full UI with all features / reduced functionality
    - Vertical prototype: Partial UI with partial features / full functionality
    - Scenario: Partial features / partial functionality (whether on computer or on paper)

- Ingredients (cont.)
  - Simplified “Thinking aloud” protocol
    - Participant “thinks aloud” while using system
    - Experimenter takes notes instead of recording electronically for later analysis

- Heuristic evaluation
Heuristic Evaluation

http://www.nngroup.com/articles/how-to-conduct-a-heuristic-evaluation/

- Evaluators (3–5) individually and systematically inspect the UI, comparing it with a set of general (and, optionally, domain-specific) evaluation heuristics
  - May need to document a specific task to evaluate and steps for performing it if evaluators are not familiar with the domain
  - Go through UI at least twice
  - Note each problem individually
- Observer may take notes
  - Eliminates note-taking burden for evaluator
  - Observer is similar to an experimenter, but
    - Records, rather than interprets (i.e., evaluator does the evaluation)
    - Provides help (especially if evaluator is not familiar with the domain)

Evaluators and observers may communicate afterwards, rate severity of problems found

- Frequency of occurrence, user impact, persistence, market impact

Evaluation heuristics

- http://www.nngroup.com/articles/ten-usability-heuristics/
- http://asktog.com/atc/principles-of-interaction-design/
Obtaining User Input

- During design ↔ After design
- In-person ↔ Remote
- Conscious user involvement ↔ Automated data gathering

Obtaining User Input: Interviews

- One-to-one (interviewer-to-interviewee)
  - Structured interview
    - Rigorously standardized questions and order
    - Easier to compare across participants
  - Semi-structured interview
    - Some questions planned in advance, but interviewer can develop new questions on the fly
    - Allows emphasis on interesting topics, exploration of unanticipated directions
  - Unstructured interview
    - Free-form
Obtaining User Input: Focus Groups

- One-to-many, several-to-many (moderator(s)-to-respondents)
  - Diversity of opinions, participants can feed off each other
  - Individuals can dominate or be intimidated
  - "We don't do focus groups. They just ensure that you don't offend anyone, and produce bland inoffensive products."
    — Jony Ive, Apple CDO

Obtaining User Input: Surveys

- Document user demographics
  - Age, gender, experience, personality
- Capture subjective reactions to system
  - Likert scales (developed by psychologist Rensis Likert ["Lick-urt"])
    | Strongly Agree | Agree | Undecided | Disagree | Strongly Disagree |
    |----------------|-------|-----------|----------|-------------------|
    | Poor           | 1 2 3 | 4 5 6 7   |          |                   |
    | Excellent      |       |           |          |                   |
- Free-form comments

Note potential problems of scale inversion and inconsistency with multiple questions
- Label text matters!
  - Extremes
  - Biases
  - Label placement matters!

Typically use an odd number of choices to allow neutrality, but sometimes use an even number to cause forced choice.

Treat as ordinal (not interval) data—can't assume users consider values equidistant, but only that n+1 > n. Note that middle is usually (but not always!) neutral.
Obtaining User Input: Surveys

- Example: QUIS (Questionnaire for User Interaction Satisfaction) [See S Table 5.1]

Overall reactions to the system:

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</tbody>
</table>

...

Ethnographic Observation

- Observation of users, based on methods used by ethnographers in field studies of cultures
  - Understand users, tasks, tools, interactions
- Holistic approach
  - Observe in natural habitat (home or work)
  - May ask questions (interview), participate in activities
  - Acquire subjective/objective data
    - qualitative anecdotes ↔ quantitative reports
- Differences with classical ethnography
  - Shorter immersion periods (e.g., hours/days vs. weeks/months)
  - Culture is often closer to that of the observer
  - Emphasis on interface design, rather than cultural understanding
User-Centered Design (UCD)

- General name for design processes that place users’ needs at the forefront, from initial conception on…
- Consider users and involve users

Participatory Design

- Involve users in design process as “fully empowered participants” (extreme UCD)
- E.g., PICTIVE (M. Muller)
  - Plastic Interface for Collaborative Technology Initiatives through Video Exploration
  - Users given paper, plastic, markers, tape to create lo-fi/low-cost mockups that are videotaped to demonstrate interaction

Muller, CHI ’91
Use Scenario

- Description of a representative way in which the system will be used
  - Each scenario tells a story
  - Often written to be rich in detail to capture reader’s interest
  - A set of use scenarios represents different users, tasks, devices, situations,…
  - Act out to try to understand consequences
    - Technologic, sociologic, economic,…
    - Privacy, safety, IP,…
  - Help developers understand needs, clients understand benefits