UX Design Principles and Guidelines

Achieve Usability Goals
Norman’s Interaction Model
Execution/Evaluation Action Cycle

Goals
What we want to happen

Execution
What we do to the world

Evaluation
Comparing what happened with what we wanted to happen

WORLD

Donald Norman, *The Design of Everyday Things*, 1990
Execution/Evaluation Action Cycle: Stages of Action

- **Goals**
  - What we want to happen
  - Event (data) driven
  - Person initiated

- **Example – frozen pizza**

- **Gulf of Execution**
  - Execution:
    - Forming intention
    - Specifying action
    - Executing action

- **Gulf of Evaluation**
  - Evaluation:
    - Evaluating interpretation
    - Interpreting perception
    - Perceiving world state

- **New state**

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WORLD
Framework to structure UX design principles and guidelines
Planning – Help Users Know *What* to Do

- Match user’s conception (mental model) of high-level task organization
- What system features exist and how to use them
- Possibilities for what users can do at every point
- Help users plan most efficient ways to complete tasks
- Keep users aware of task progress
- Provide cognitive affordances to remind users to complete tasks
Translation: Help Users Know *How To Do Something*

- Effective cognitive affordances
  - Users know/learn what actions are needed to carry out intentions
  - Users successfully predict action outcomes
  - Users determine how to get started
- Cognitive affordances are visible – legible text, font size, color, background contrast
- Timely, before associated exploit
- Similar cognitive affordances have consistent appearance
Translation: Cognitive affordances are visible

Figure 22-12: The sign is visible if you look carefully
Translation: Content and Meaning of Cognitive Affordance

• Use precise wording and naming for clarity in labels, menu titles, menu choices, icons, data fields
  • E.g., complete labels by adding a noun
• Make choices distinguishable but consistent
  • Similar (different) names for similar (different) kinds of things
    • Avoid multiple synonyms for the same thing
  • Similar objects for similar kinds of functions
  • Consistent wording to express similar choices
Translation: Content and Meaning of Cognitive Affordance

• Control complexity with object proximity and grouping
  • By related tasks and functions (more on this later)

• Recognition over recall
  • Recognition: remembering with the help of a visual clue
  • Recall: remembering with no help
  • Recognition is much easier
Translation: Design for Learnability, Memorability and Human Memory

• Don’t assume because the interface tells the user something, they learn and remember it
• Working memory
  • Small 7 ± 2 chunks
  • <10 sec decay
  • Rehearsal can impact decay
• Long term memory
  • Infinite in size and duration
  • Extensive rehearsal transfers chunks
• Chunk is a unit of memory or perception
  • Hard: M W B C R A L O A B I M B F I
  • Easier: MWB CRA LOA BIM BFI
  • Easiest: BMW RCA AOL IBM FBI
• Stacking – task interruptions, limited depth
Translation: Task Efficiency

• Provide alternative ways to perform tasks
• Provide shortcuts
• Provide keyboard alternatives to avoid physical “switching” actions
• Task thread continuity
  • Anticipate most likely next action, step, or task path
  • If you tell them what they should do, help them get there
• Do not make user redo any work, reenter data
• Retain user state information
  • Example, having to find folder you are working in, over and over
• *Keep the user in control*
  • Good interfaces are explorable, errors are forgiven
Physical Actions: Help Users Do Tasks

- Necessary physical affordances in user interface
- Sensing UI objects for and during manipulation
- Manipulating UI objects, making physical actions
- Avoid physical awkwardness and fatigue; e.g., shifting from mouse to keyboard constantly
- Accommodate disabilities
  - Range of motion, fine motor control, vision, or hearing
  - (More on this later)
- Fitts’ law issues
Physical Actions: Design for Understandability

- **Human Errors**
  - Failure to execute a learned task – Slips and Lapses
    - Slip: action not carried out as intended or planned
    - Lapse: missed actions and omissions due to short term memory failure - Interruptions, loss of intent
    - Typically found in skilled behavior
    - Most common human error – due to inattention
  - Use the wrong task - Mistakes
    - A type of error caused by a faulty plan/intention
    - Typically found in rule-based or problem-solving behavior

- **Error Prevention**
  - Different things should look and act differently
  - Risky (consequential, hard to recover from errors) actions are separated from frequently used ones
  - Avoid lapses – keep task steps short, include forcing functions that require a sequence of steps (trade off of user freedom)
  - Disable illegal commands
Outcomes

• Internal, invisible effect/result within system
• Outcomes must be revealed to user via system feedback
• Where usefulness lives
• Functional affordance of non-user-interface system functionality
• Issues are about computational errors, software bugs
Outcomes: Design for Efficiency - Performance

• Perceptual fusion – two stimuli within perceptual cycle appear fused; $T_p \sim 100$ msec
• Response times:
  • $< 100$ msec – instantaneous
  • $0.1 – 1.0$ sec – user notices the delay
  • $1.5$ sec – display busy indicator
  • $>1.5$ sec – display progress bar
• 2-Second-Rule: users should not have to wait longer than 2 seconds for common UI actions
• 3-Click-Rule – users should not have to wait longer than three clicks to do something useful
Outcomes: Response Time (1 sec.)
Outcomes: Response Time (0.1 sec)
Outcomes: Automation

Want to bang tonight?

I meant hang. Duck auto-cucumber.

God donut.

How the duck do I turn this off?

It's painful watching you struggle man.
Assessment: Design helping user know if interaction was successful

• Provide some type of feedback for all user actions
  • Helps keep the user grounded in the interactive cycle
  • Understandable error messages when things don’t work
  • Progress feedback on long operations
  • To prevent costly errors, solicit user confirmation before potentially destructive actions
    • Information on alternatives
    • But do not overuse and annoy

• Presentation of feedback
  • visible, noticeable location; augment with audio
  • Content, meaning of feedback
Assessment

- Feedback wording
  - Helpful, informative
  - Positive psychological tone; it’s the system’s fault
  - Language of the user and domain context
Assessment

Mail Server Query

Results for hartson.cs.vt.edu

send: invalid spawn id (6) while executing "send "1$pid\\r\n" (file "/genpid_query.pass" line 31)
Broad Guidelines:

• Simplicity
  • Given two otherwise equivalent designs, the simplest is best (Ochham’s Razor)*
  • Effective and simple is a challenging design objective
  • 80/20 rule – 20% of functionality gets used 80% of the time

• Consistency
  • Do similar things in different places the same way
  • Label similar things the same
  • A custom design style book can help
Broad Guidelines

- **Use of language**
  - Avoid poor attempts at humor
  - Avoid use of anthropomorphism
  - Avoid using first-person speech
  - Avoid condescending help
    - Examples, Clippy and Bob
  - Use positive psychological tone
  - Avoid violent, negative, demeaning terms
  - Avoid use of psychologically threatening terms, such as “illegal,” “invalid,” and “abort”
  - Avoid use of term “hit”; instead use “press” or “click”

- **More later on …**
  - Grouping
  - Color
  - Text
  - Accessibility
  - Web and small screen
  - Internationalization
Activity

Work on the detailed design of your project, make sure to follow the UX guidelines during the whole Execution/Evaluation Action Cycle:

1. Planning:
2. Translation:
3. Physical Actions
4. Outcomes
5. Assessment