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

Gulf of Execution

Execution

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

Example – frozen pizza

Forming intention
Specifying action
Executing action

Evaluation

Evaluating interpretation
Interpreting perception
Perceiving world state

Gulf of Evaluation

WORLD

New state
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 22-11: Aesthetic panel blocks visibility of sign as cognitive affordance

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

Find the consistency problem(s)
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

* “Entities should not be multiplied without necessity.” William of Ockham, 14th century Franciscan friar
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