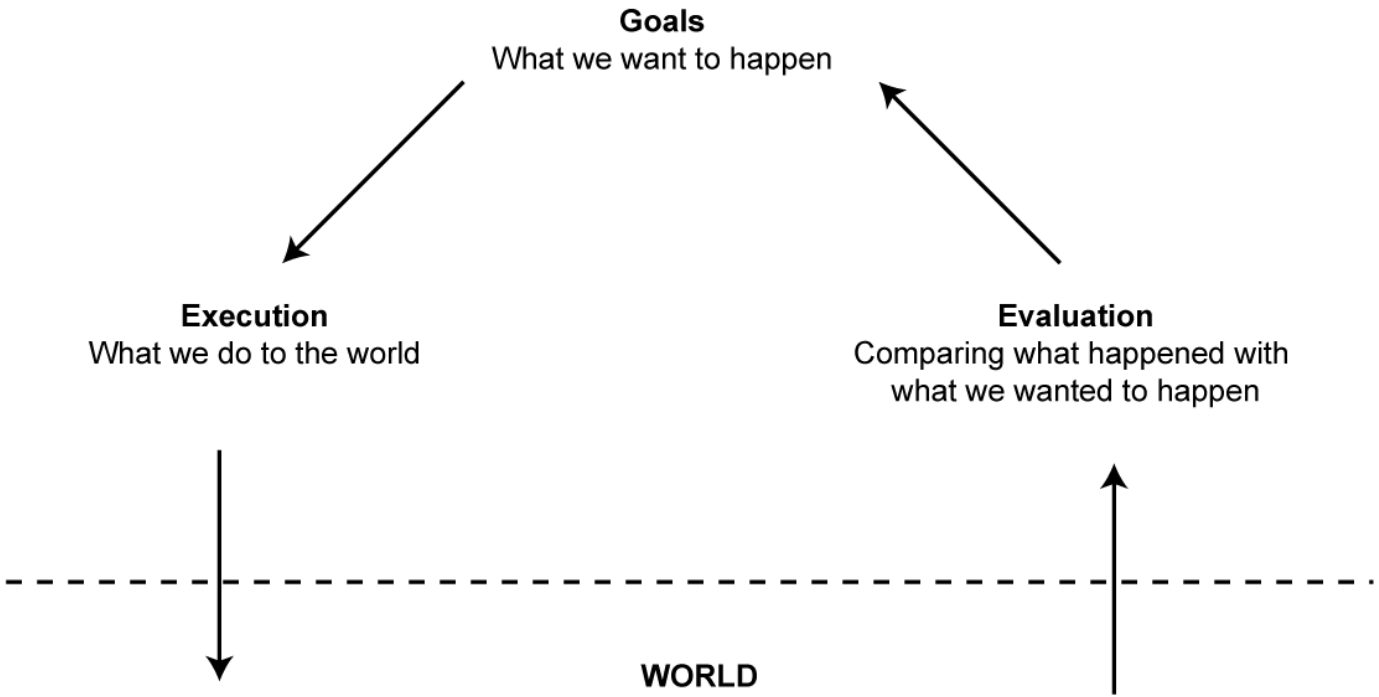
UX Design Principles and Guidelines

Achieve Usability Goals

Norman's Interaction Model
Execution/Evaluation Action Cycle

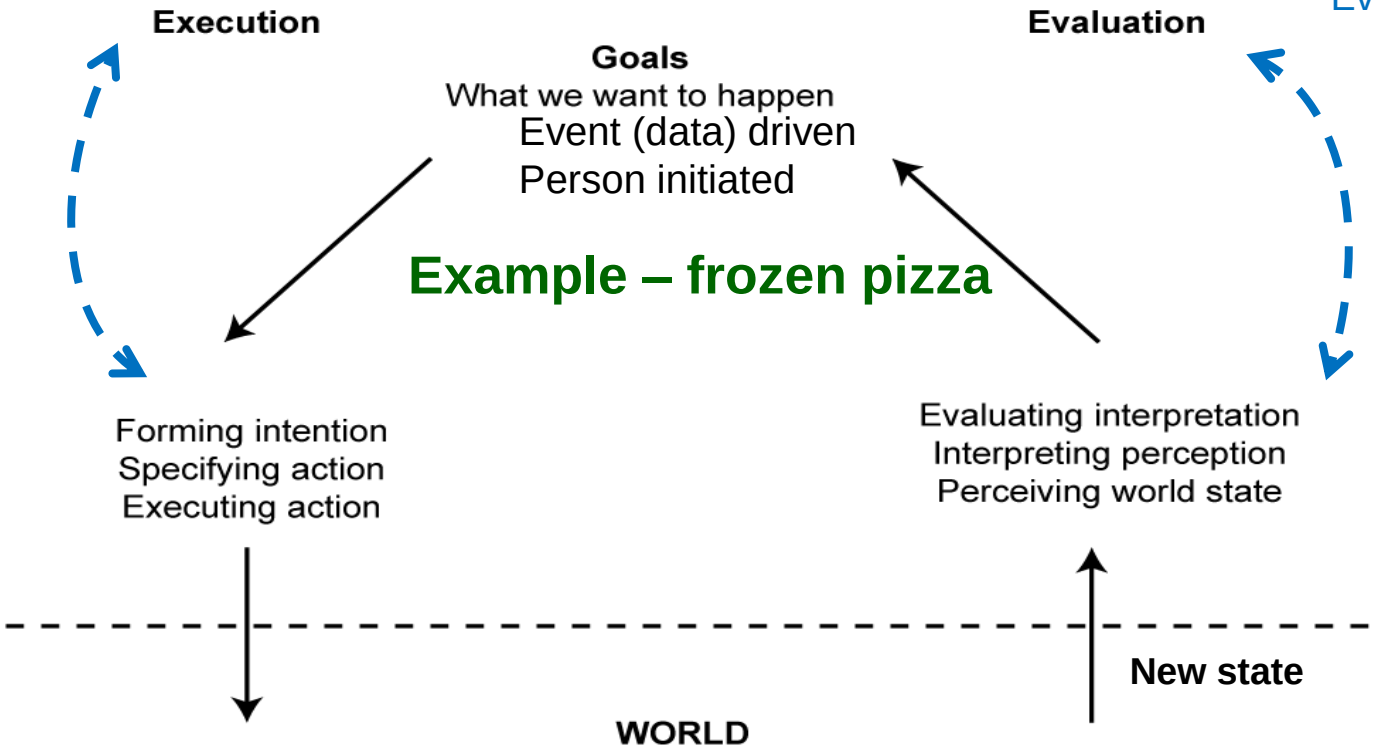


Donald Norman, *The Design of Everyday Things*, 1990

Execution/Evaluation Action Cycle: Stages of Action

Gulf of Execution

Gulf of Evaluation



Software Engineering
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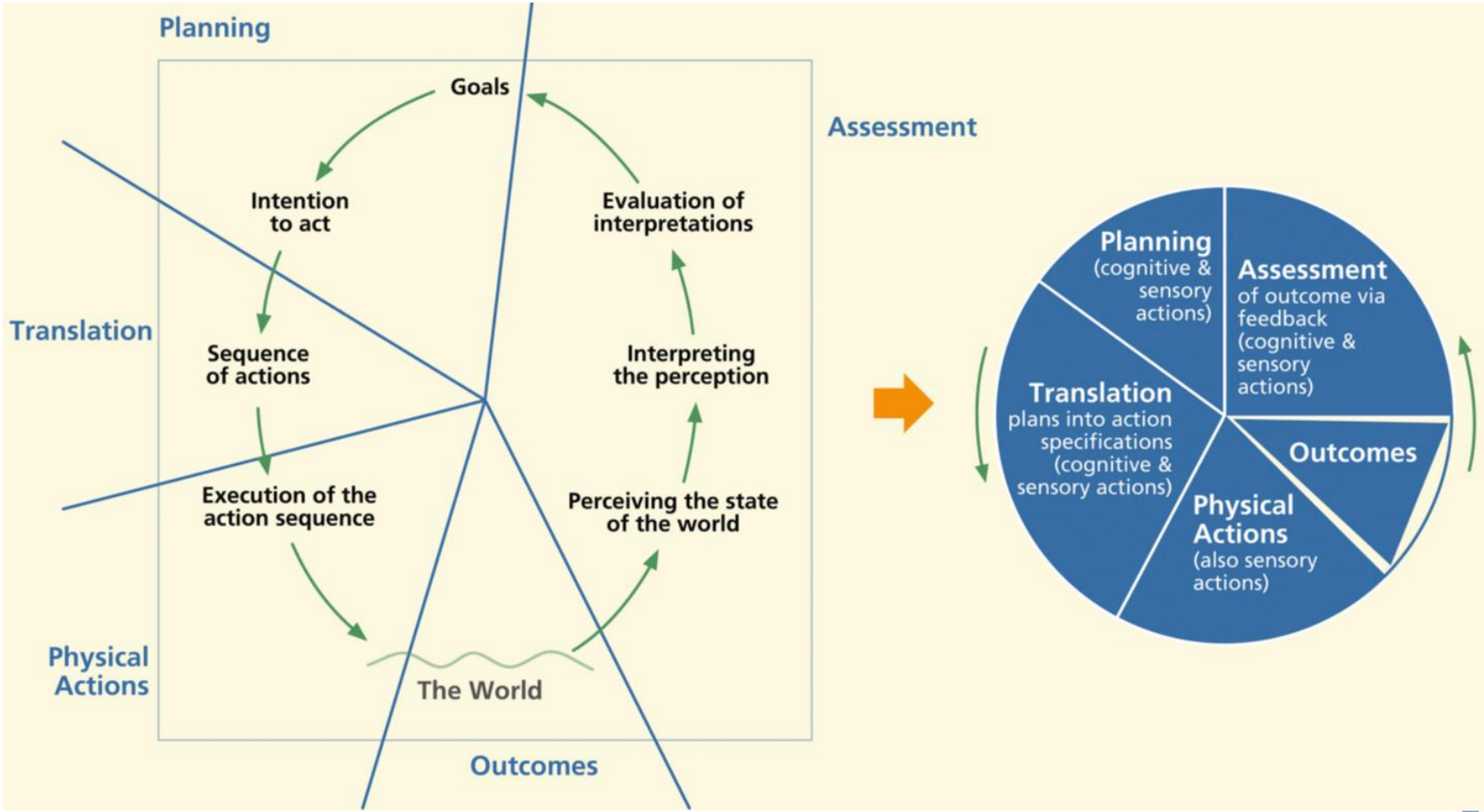


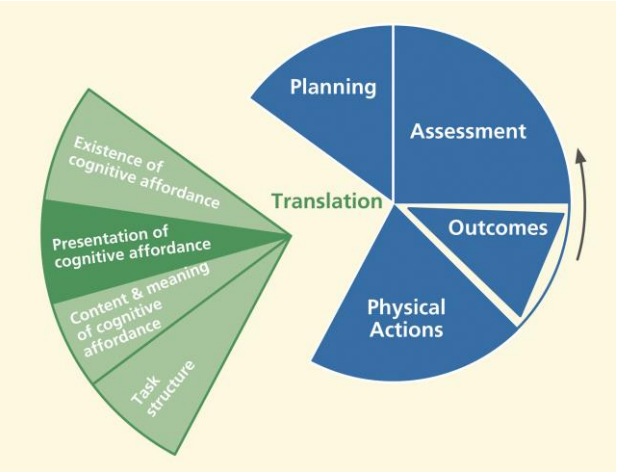
Framework to structure UX design principles and guidelines

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



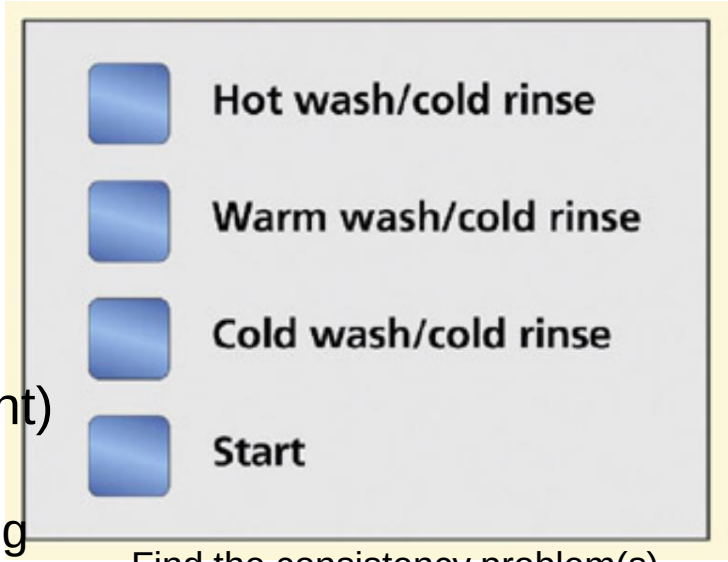
Translation: Cognitive affordances are visible

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

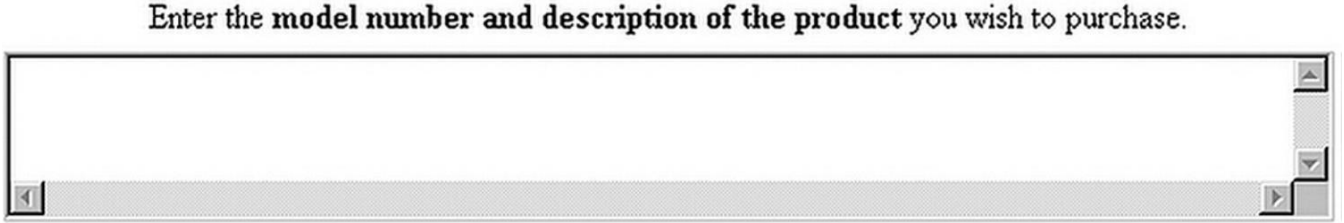


Find the consistency problem(s)

Translation: Content and Meaning of Cognitive Affordance

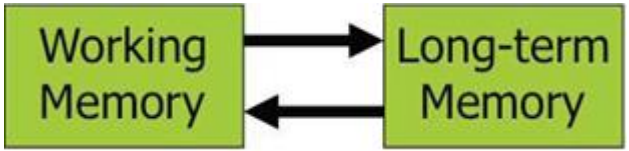
- Control complexity with object proximity and grouping
  - By related tasks and functions (more on this later)

- 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

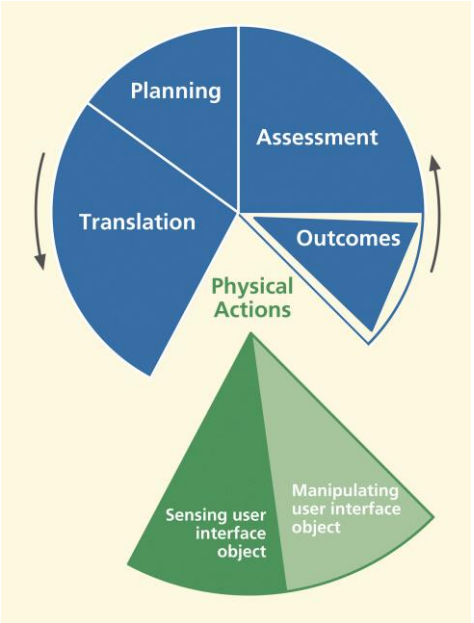


Translation: Task Efficiency

- 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

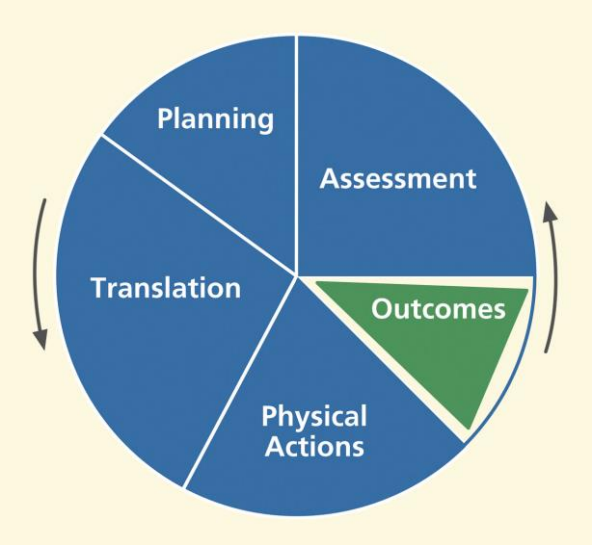


Physical Actions: Design for Understandability

- 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 ~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)

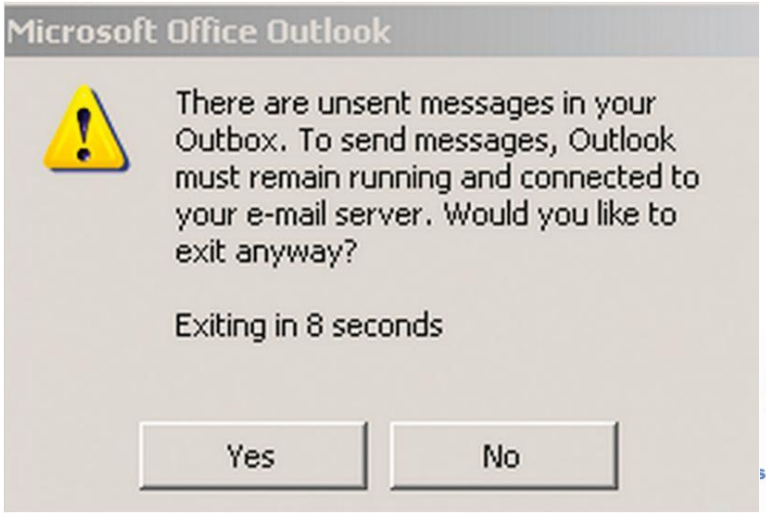
Outcomes: Automation

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

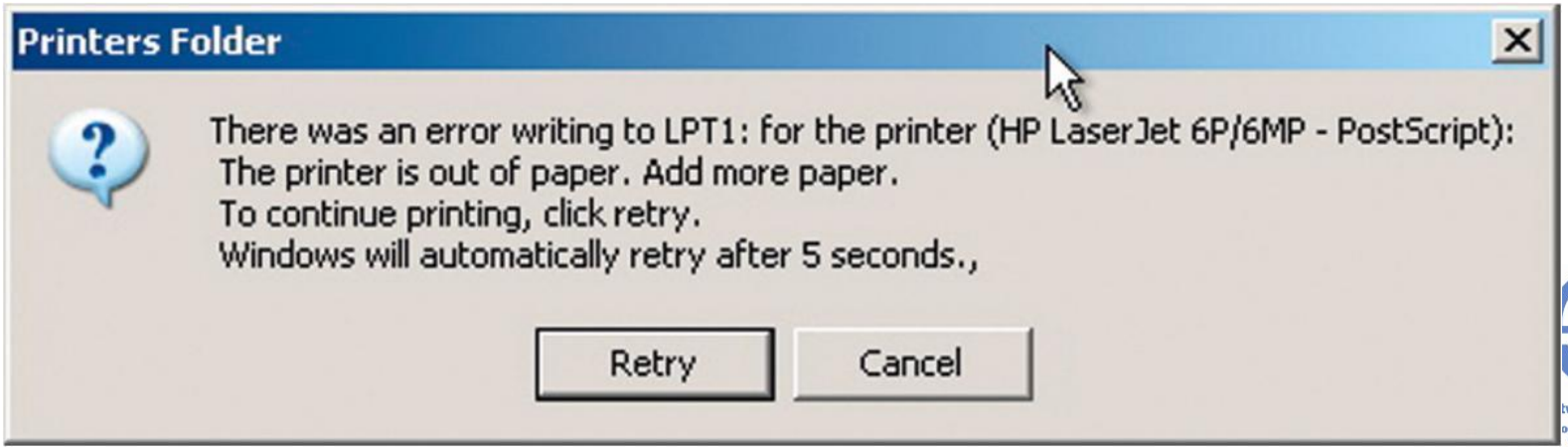


Assessment

Mail Server Query

Results for hartson.cs.vt.edu

send: invalid spawn id (6) while executing "send "1$pid\r"" (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