



Fundamentals of Interaction

With lots of credit to Khai Truong for help on this lecture



Laboratory for Ubiquitous Computing and Interaction
Donald Bren School of Information and Computer Sciences | University of California, Irvine

Announcements, Questions

- R2 due Today! (hopefully, you all posted online)
- Things have started to show up in your gradebook
- Questions?



Agenda

- Announcements
- Lecture – Fundamentals of Interaction
- Design Activity
- Lecture – Usability

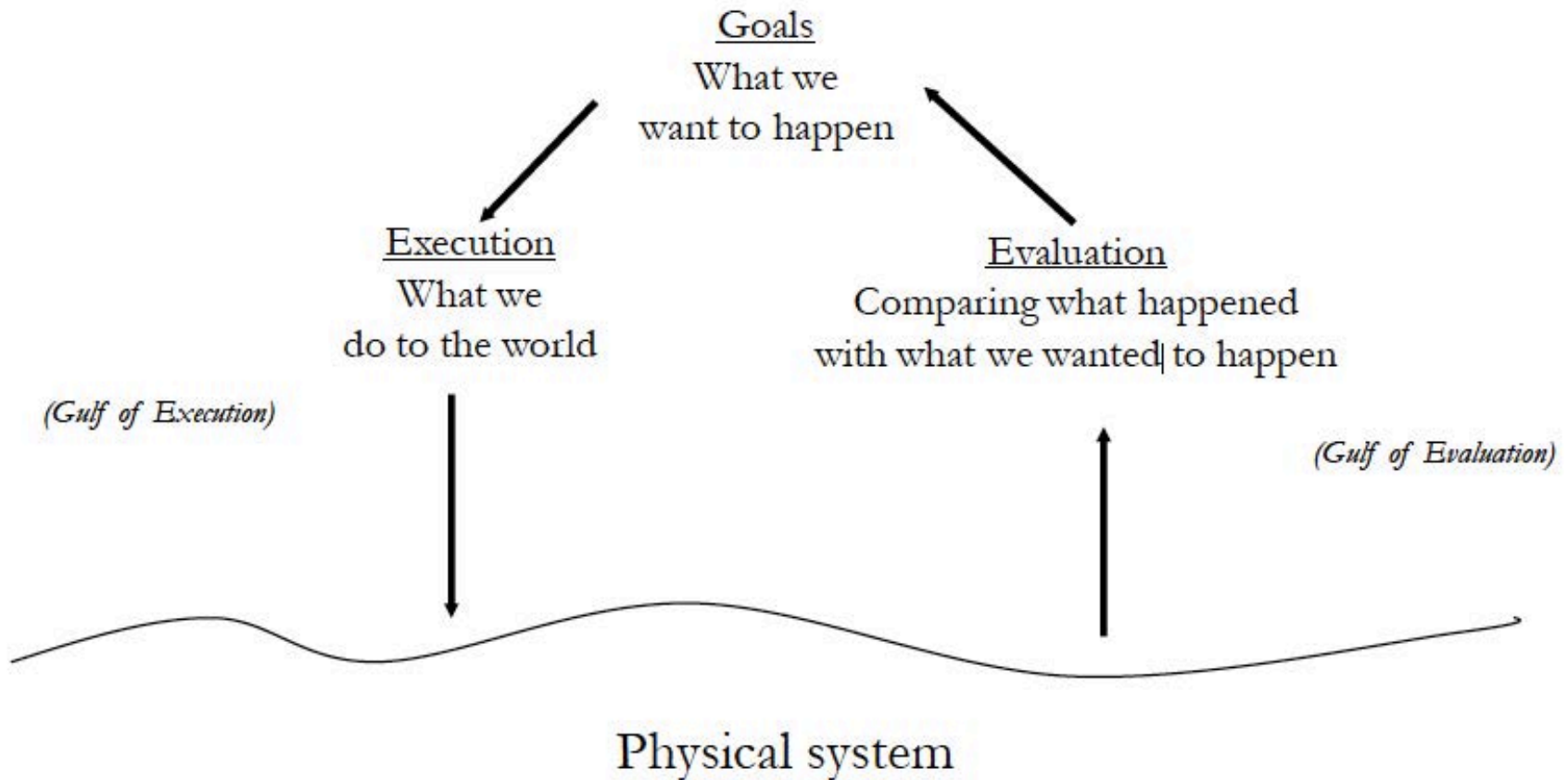


The Design of Everyday Things

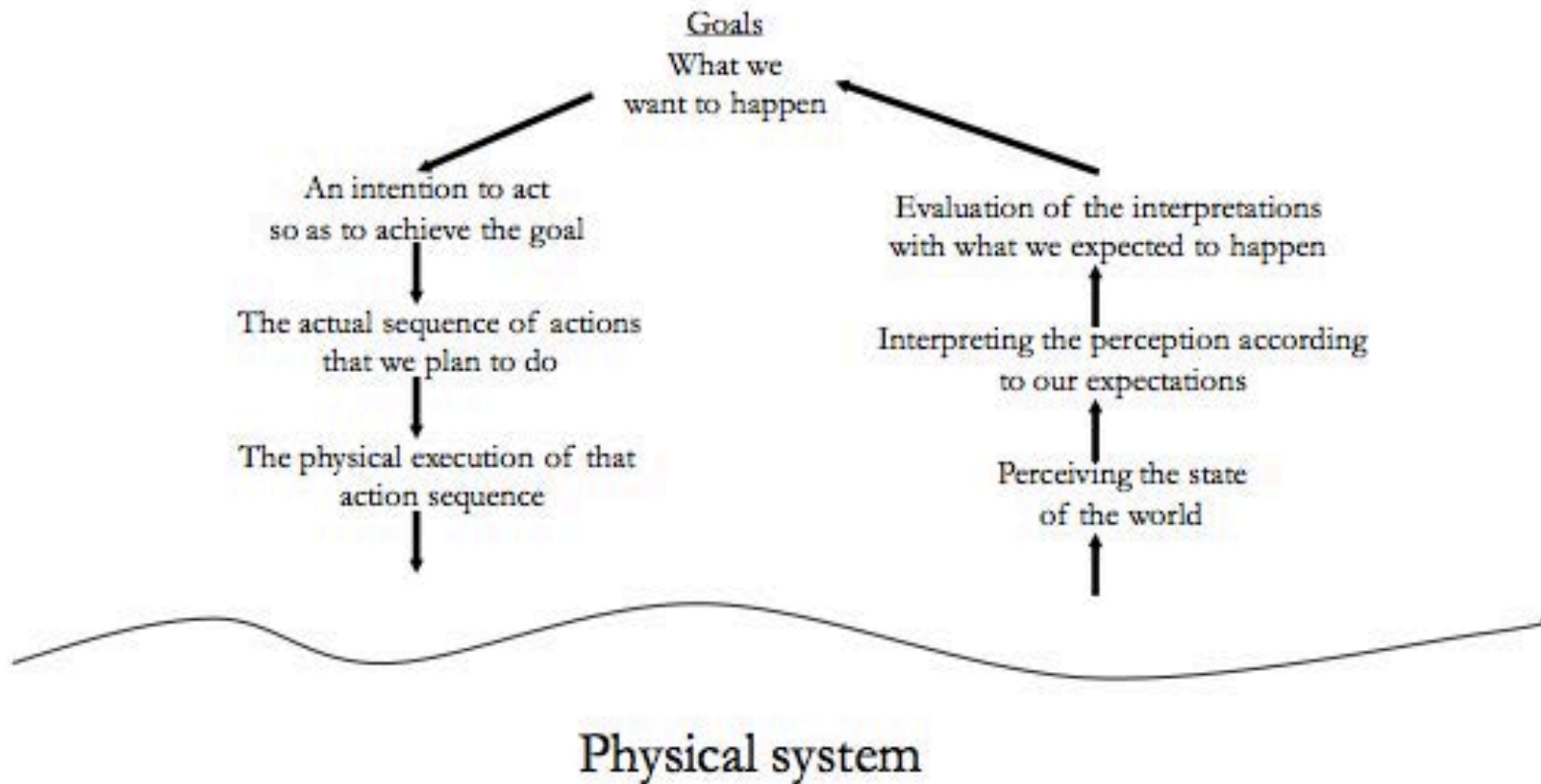
- Written by Don Norman
 - Northwestern University
 - NielsenNormanGroup
- The hidden frustrations with everyday things
- Principles for design



Goals, Execution, & Evaluation



Seven Stages of Action



Important Design Principles

- Natural mapping
- Visibility
- Perceived affordance
- Constraints
- Feedback
- Mental models / conceptual models



Mapping

- The relationship between two things
- Relationship between controls & their manipulations and the results in the world





Or



Visibility

- Make capabilities perceivable and interpretable
- Counteracting factors
 - Features
 - Aesthetics
 - Abstractions



Visibility

- When number of functions is greater than number of controls, functionality is often hidden
- When capabilities are visible, it does not require memory of how to use
- Leverage recognition over recall
 - Knowledge “in the world” vs. “in the head”





Feedback

- Sending back to the user information about what action has actually been done, what result has been accomplished
- I.e., let someone know what just occurred
 - Can be sound that's made
 - Can be change in physical state





SMS



Chat

Affordance

- Perceived and actual cluea about something
 - ...that determine just how a thing could possibly be used
- How does this apply to design?
- Complex things may need explanation, but simple things should not
- If a simple thing requires instructions, it is likely a failed design



Note: not a real example



Norman's pet peeve: door handles

Home | These things I believe.


Not The User's Fault

Jono at Mozilla Labs

February 12, 2009

What's wrong with this door?

Posted by jonoscript under Uncategorized | Tags: affordances, UI FAIL | [16] Comments



In the Mountain View building complex that houses the main Mozilla offices, there are many doors like this one.

Archived Entry

Post Date :
February 12, 2009 at 10:12 pm

Category :
Uncategorized

Tags: affordances, UI FAIL

Do More :
You can leave a response, or
trackback from your own site.

From <http://jonoscript.wordpress.com/2009/02/12/whats-wrong-with-this-door/>





In the Mountain View building complex that houses the main Mozilla offices, there are many doors like this one.



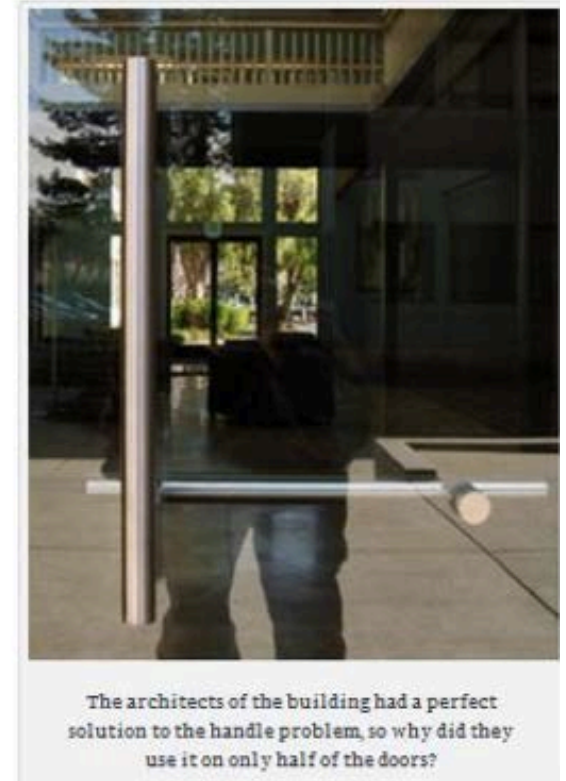
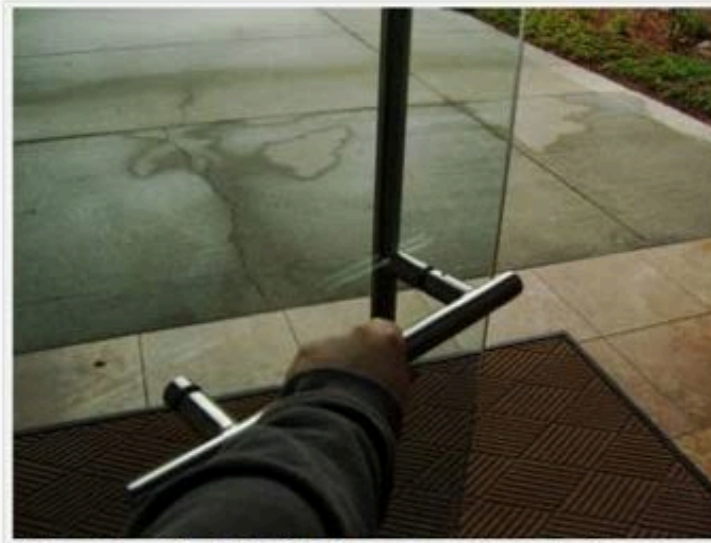
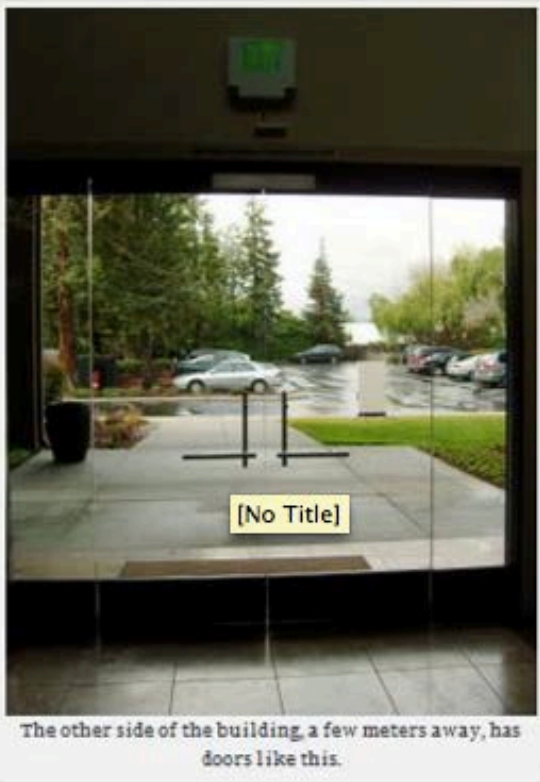
What's your natural reaction to a vertical door handle? You grab it like this...



...and pull it to open, right?



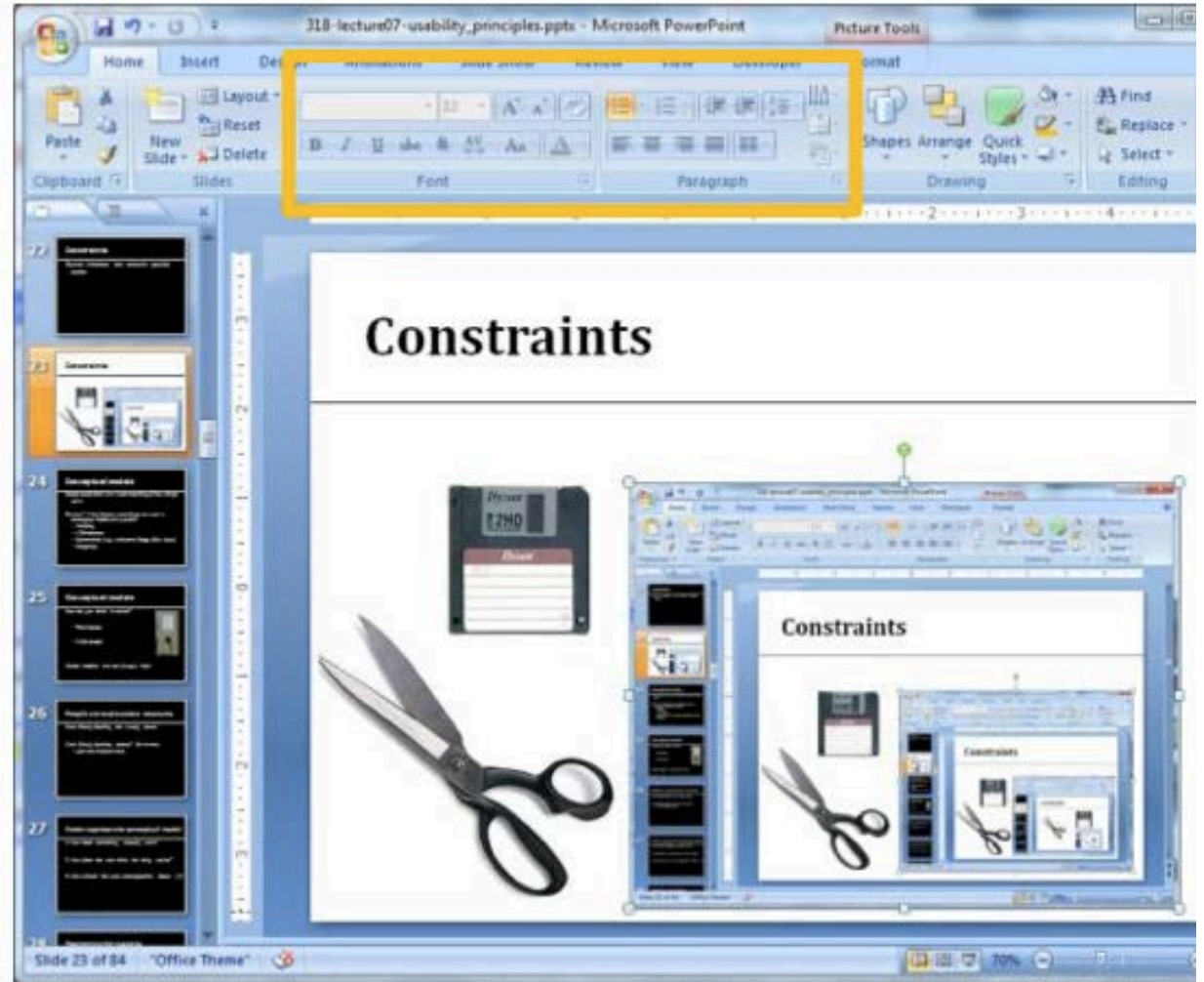
But if you're on the inside of the door, then pulling does nothing. EVERY SINGLE PERSON who I've seen encounter these doors has made this mistake.



Constraints

- Physical limitations that constrain possible actions





Conceptual Models

- People build their own understanding of how things work
- But how? What factors contribute to a user's conceptual model of a system?
 - Visibility
 - Affordances
 - Constraints
 - Mappings



Conceptual Models

- How do you think it works?
- Mental models are not always right



People are explanatory (usually)

- Sometimes they get it right
- Sometimes they blame the wrong cause
- Sometimes they blame themselves
 - Learned helplessness



Designers should work to foster the appropriate conceptual model

1. How does something actually work?
2. How does the user think the thing works?
3. How should the user conceptualize about (1) ?



Designing for people

- Designers are not users & vice versa
 - The user is not like me!!!
- Provide clear mappings between controls and behaviors
 - Make states & possible actions/behaviors visible
 - Afford & constrain the intended use
 - Provide feedback of actions/behaviors
 - Foster appropriate mental models



Design Activity - Designing Under Constraints

- UCI has asked you to redesign a new Anteater card that must satisfy the following constraints:
 - It must be 3.370" × 2.125" in size
 - It can only use 3 colors (but can use fewer)
 - It must include a 1" x 1.5" photo area
 - It must include the owner's name and status (e.g., undergraduate, graduate, faculty, staff, etc.)
 - It must have an ID # somewhere
 - It must use a UCI icon or label
 - It must have space for a transit sticker of any size
 - It cannot use the existing Anteater ID layout and design
- Work in small groups on your design, then we will re-group and compare (15 minutes)



Principles of Usability

- **Learnability**
 - Ease with which new users can begin effective interaction & achieve maximal performance
- **Flexibility**
 - Multiplicity of ways in which the user & system exchange information
- **Robustness**
 - Level of support provided to the user in determining successful achievement & assessment of goals



Learnability: Predictability

- Based on the user's interaction with the system thus far, can the user determine the result of a future interaction with the system?
- I think that this action will do...



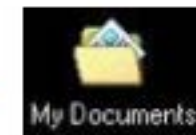
Learnability: synthesizability

- Based on the current state, can the user accurately assess the effect of past operations?



Learnability: familiarity

- Does the user's existing knowledge correspond to the knowledge necessary to effectively interact with the system?



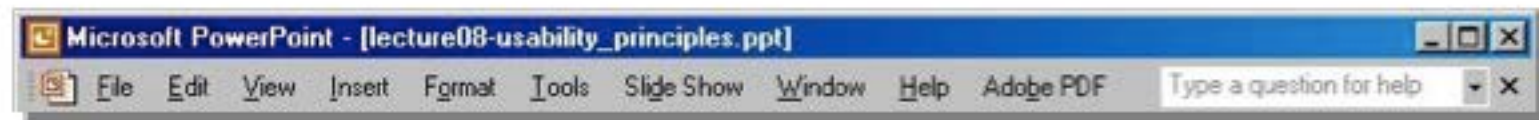
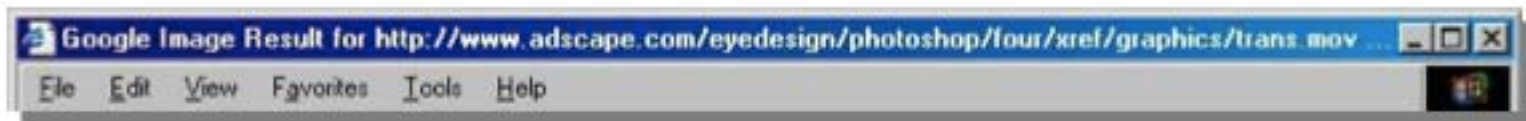
Learnability: generalizability

- Can the user's knowledge from a specific interaction with the system be extended to apply to similar, novel interactions?



Learnability: consistency

- Do similar situations or similar task objectives result in similar system behaviors?



Flexibility

- Dialog initiative
- Multi-threading
- Task migratability
- Substitutivity
- Customizability

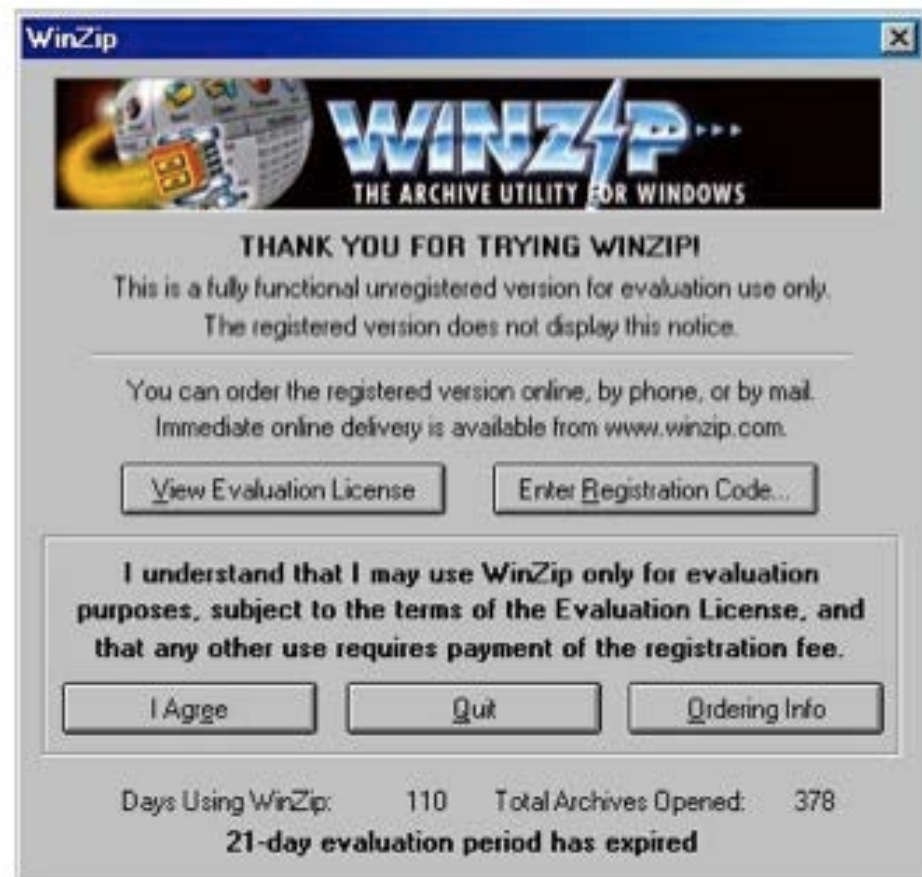


Flexibility: dialog initiative

- Does the user have the control and freedom to initiate system requests, or does the system constrain the user's actions?
 - User pre-emptive
 - System pre-emptive



Dialog Initiative



Flexibility: multi-threading

- Does the user-system dialog allow for multiple separate threads of interaction?
- Two types
 - Concurrent: input to multiple tasks simultaneously
 - Interleaved: many tasks, but input to one at a time



Flexibility: multi-threading

Does the user-system dialog allow for multiple separate threads of interaction?

Two types

- Concurrent: input to multiple tasks simultaneously
- Interleaved: many tasks, but input to one at a time

Slide 58 of 65 "Office Theme" Tony Tang

1 - 100 of 26445 Order: Oldest

12:23 pm

12:15 pm

11:55 am

11:42 am

11:36 am

The_Deep_Dive.mvid.avi - VLC media player

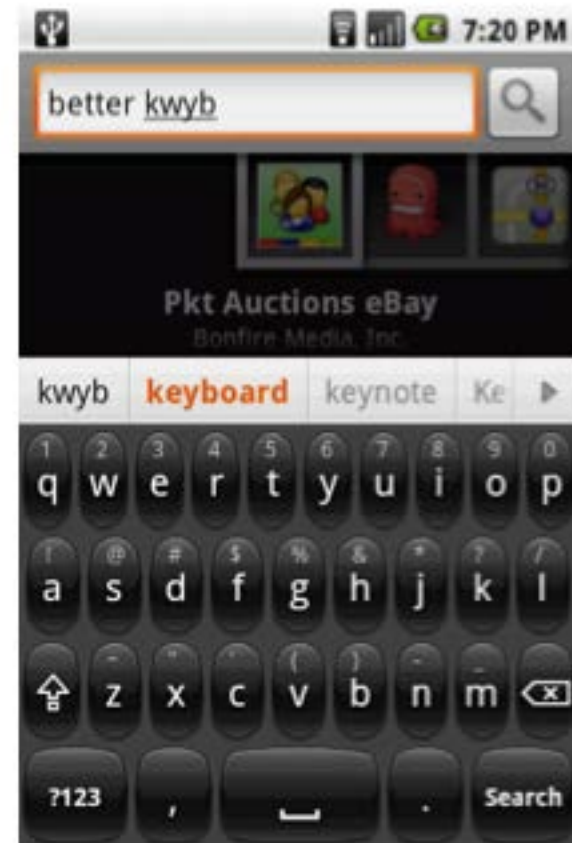
Media Playback Audio Video Tools View Help

00:43/22:01



Flexibility: task migratability

- Can control over a task be passed between the user and the system as necessary?



Flexibility: substitutivity

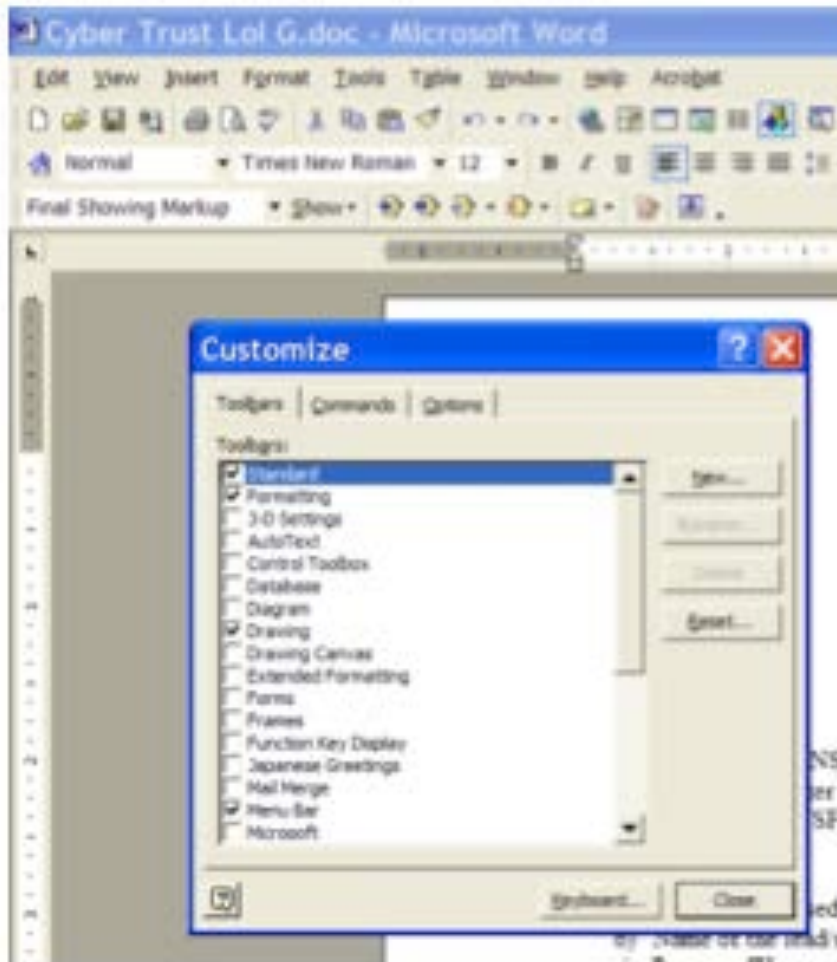
Can equivalent values be substituted for each other and recognized as the same by the system?



Flexibility: customizability

- Is the interface modifiable by the user and/or the system?
 - **Adaptability:** The user's ability to adjust the forms of input and output
 - **Adaptivity:** The automatic customization of the interface by the system





Adaptable



Adaptive



Robustness




- Observability
- Recoverability
- Responsiveness
- Task conformance



Robustness: observability

- Can the user evaluate the internal state of the system based on its external and perceivable representation?
 - **Browsability** – allows user to explore more about system
 - **Reachability** – understand possible interactions/ states of a system
 - **Persistence** – allow user to understand and act on effect of a system (after some duration)



PID	Process Name	User	% CPU ▾	Threads	Real Mem
3317	Flash Player (Safari Internet plug-in)	gillianrh	5.7	20	291.2 MB
3303	Safari Web Content	gillianrh	3.2	12	510.6 MB
3305	AdobePDFViewerNPAPI (Safari Internet plug-in)	gillianrh	2.3	13	82.3 MB
3528	screencapture	gillianrh	1.8	5	3.4 MB
3523	Dashboard	gillianrh	1.8	8	24.0 MB
167	distnoted	gillianrh	0.8	9	4.1 MB
3525	 Activity Monitor	gillianrh	0.8	7	14.7 MB
3248	 Microsoft PowerPoint	gillianrh	0.5	11	238.6 MB
3294	 Safari	gillianrh	0.1	14	122.8 MB
186	 Finder	gillianrh	0.1	11	114.7 MB
249	Google Drive	gillianrh	0.1	18	76.2 MB
185	SystemUIServer	gillianrh	0.1	7	22.8 MB
3522	Dashboard	gillianrh	0.0	10	20.3 MB
218	CalendarAgent	gillianrh	0.0	6	56.1 MB
227	cookied	gillianrh	0.0	3	3.7 MB
3524	mdworker	gillianrh	0.0	3	7.3 MB
250	Dropbox	gillianrh	0.0	17	42.4 MB
52	loginwindow	gillianrh	0.0	2	20.7 MB

CPU | System Memory | Disk Activity | Disk Usage | Network

Packets in: 1675052

Data received: 652.2 MB

Packets out: 2908046

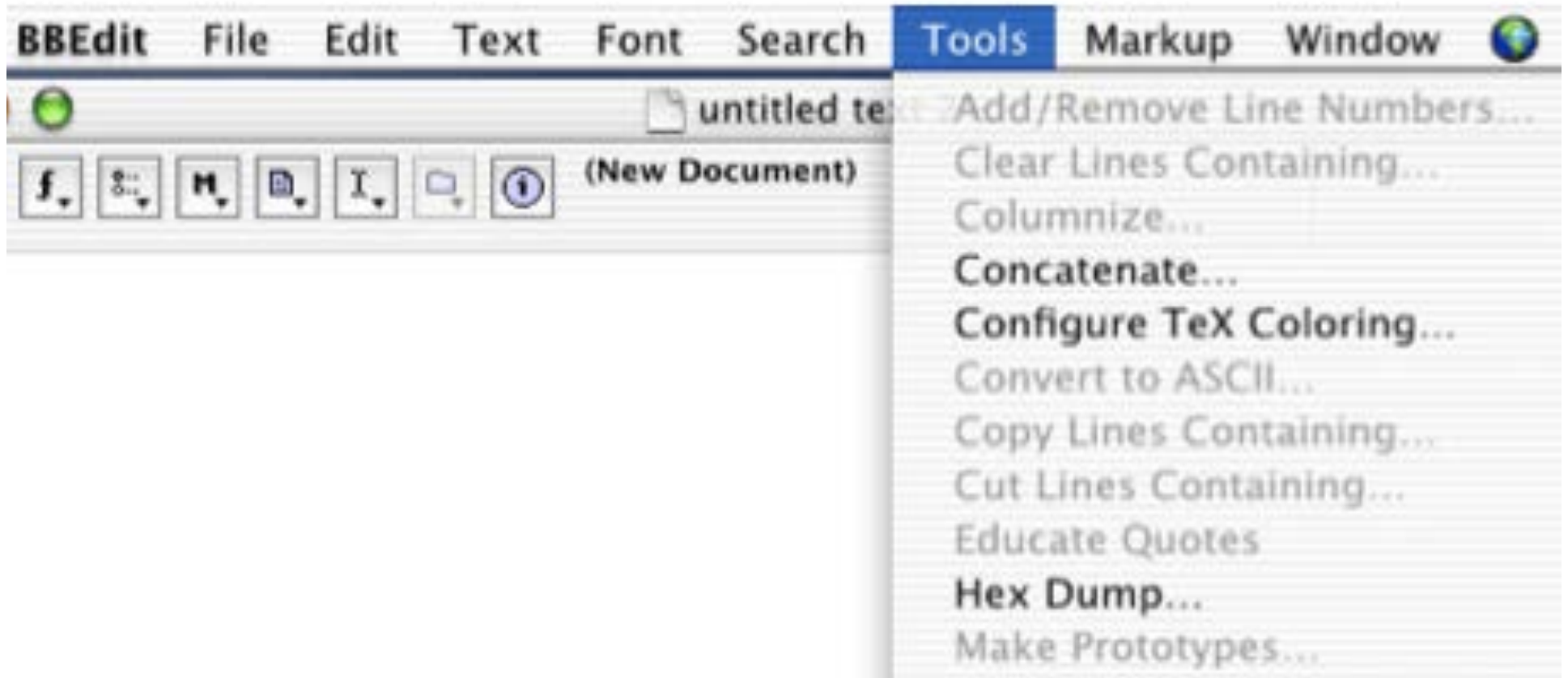
Data sent: 3.44 GB

Peak: 86 bytes/sec

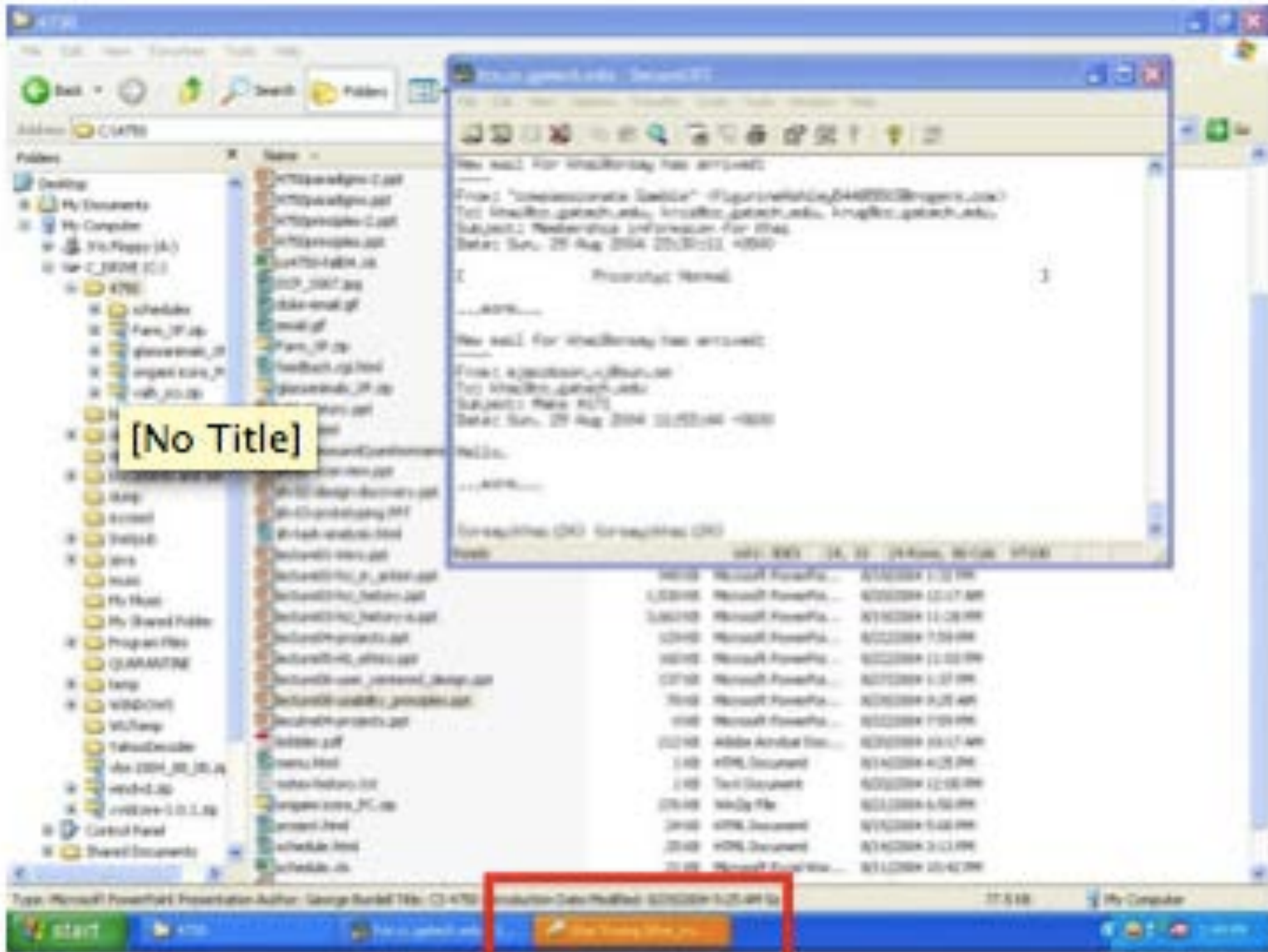


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Reachability



Persistence

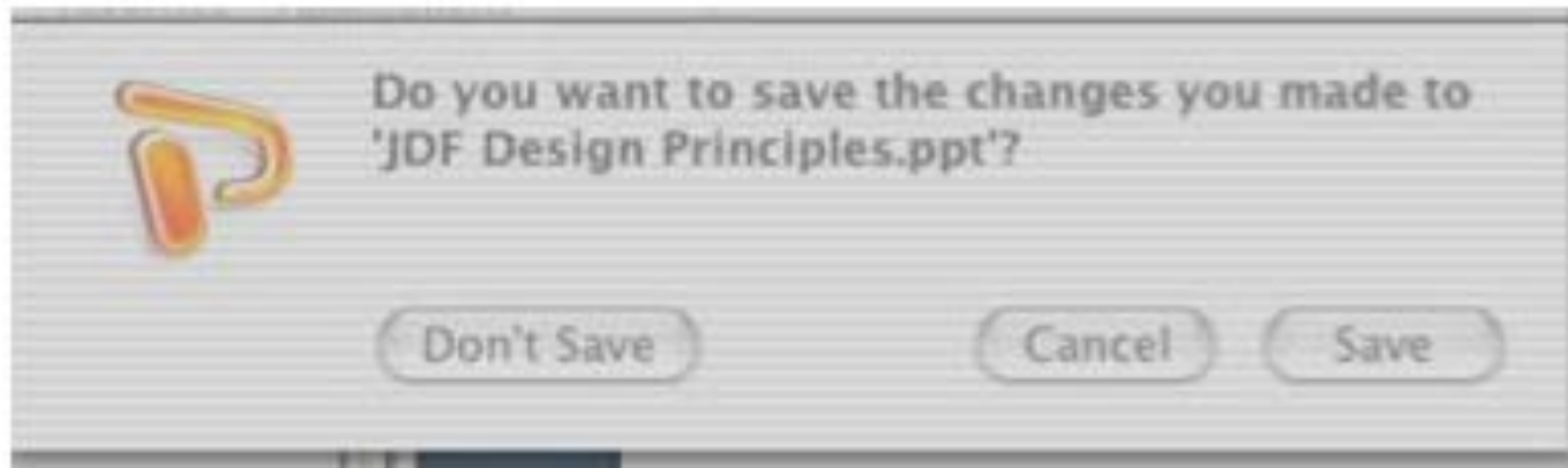


Robustness: recoverability

- Can the user reach the desired goal or accomplish the task after recognizing that s/he has made an error in a previous interaction?
- Backward recovery: undo previous error(s)
- Forward recovery: ability to fix when user can not undo

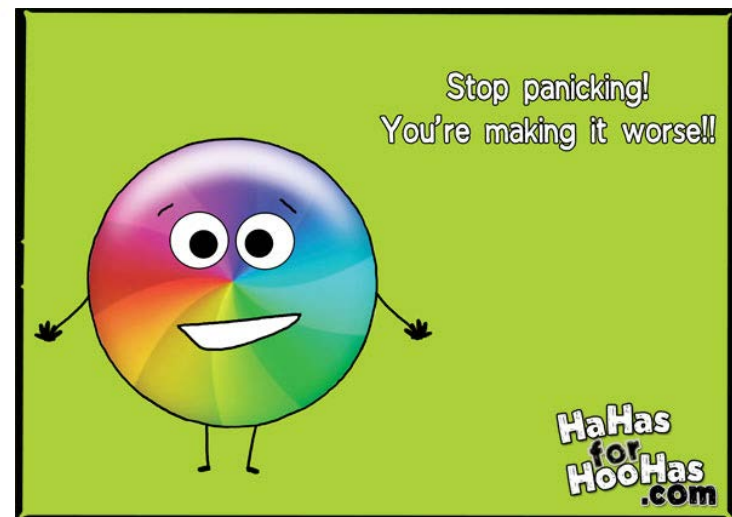
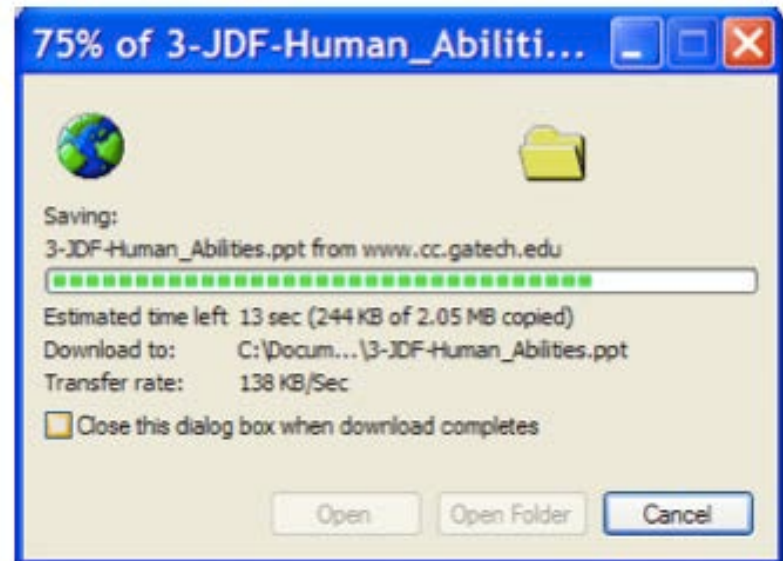


Error Prevention



Robustness: responsiveness

- Is the rate of communication between the system and the user fast enough/appropriate for the interaction?
- Response time: time for system to respond in some way to user action(s)
- Response should match user expectations



Robustness: task conformance

- Does the system support the tasks that the user wants to accomplish, and does the system support these tasks in the way that the user wants it to?
- I.e., mapping between system services and all the user tasks
- Task completeness: can system do all tasks of interest?
- Task adequacy: can user understand how to



Robustness: Task Conformance



Next Class

- Thursday
 - User Research, Part 1
- Upcoming Work
 - A1: Thinking about Design, due on paper in class at START OF CLASS Thursday
 - S2: Health theme, due in your sketch books when we do the sketching critique on Thursday

