Human-Computer Interaction
IS4300

P6 – Software Prototyping

- DUE NOW
- IMPORTANT:
  - Your system must actually run and support your 3+ tasks to some level of fidelity.
  - Other students in the class must be able to download your software on any readily available computer and walk through the 3 tasks with little or nor help from you.
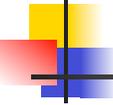
Computer-Supported Cooperative Work (CSCW)

- Def.: "the study of how people work together using computer technology"
- Examples of systems that you use?
  - email
  - shared databases/hypertext
  - video conferencing
  - chat systems
  - real-time shared applications
    - collaborative writing, drawing, games

Groupware

- *Groupware* denotes the technology that people use to work together
  - "systems that support groups of people engaged in a common task (or goal) and that provide an interface to a shared environment."
- *CSCW* studies the use of groupware
  - "CSCW is the study of the tools and techniques of groupware as well as their psychological, social, and organizational effects."

Collaboration

- What is "collaboration"?
  - How do we classify applications?
- Frequently people need to cooperate
  - create/modify documents, drawings, designs
- Two key ways
  - at different times (asynchronously)
    - see changes previous workers have made
  - simultaneously (synchronously)
    - actions taken by user must be seen immediately

CSCW apps
aka Groupware

	same place	different place
synchronous communication	• smart meeting rooms • shared PCs/editors	• SMS, IM • MUDs • Shared work surfaces • Shared PCs/editors • Shared calendar
asynchronous communication	• argumentation • co-authoring (word) • PARC Tab	• email • bulletin board, USENET

Collaboration
Shuman & Twobly, The Real Power of Collaboration, 2009

- Collaboration is a purposeful, strategic way of working that leverages the resources of each party for the benefit of all by coordinating activities and communicating information within an environment of trust and transparency.

Taxonomy of Collaboration
Camarinha-Matos, et al, 2006

Integration level				
				Joint goals **Joint identities** **Working together** (Creating together)
			Compatible goals **Individual identities** **working apart** (with some coordination)	*Compatible goals* *Individual identities* *Working apart*
		Complementary goals (aligning activities for mutual benefit)	*Complementary goals* *Aligning activities*	*Complementary goals* *Aligning activities*
	Communication & Information exchange	*Communication & Information exchange*	*Communication & Information exchange*	*Communication & Information exchange*
	Network	**Coordinated Network**	**Cooperative Network**	**Collaborative Network** **Coallition's type**

Types of Cooperation
Dix

- Focused partnerships
  - users who need each other to complete a task
    - often a document or image to work on
    - e.g., joint authors of a paper
- Lecture or demo
  - person shares info. with users at remote sites
    - questions may be asked
    - may wish to keep history and be able to replay

Types of Cooperation (cont.)

- Conference
  - group participation distributed in space
    - at same time or spread out over time
- Structured work process
  - a set of people w/ distinct roles solve task
    - e.g., hiring committee accepts applications, reviews, invites top for interviews, chooses, informs
  - aka "work flow" or "task flow"

Types of Cooperation (cont.)

- Meeting and decision support
  - meeting w/ each user working at a computer
    - e.g., PDA Brainstorming tool

Classification by Function

Cooperative work involves:
  Participants who are working
  Artifacts upon which they work

understanding

participants   P ← direct → P
   communication

control and
feedback

artifacts of work   A

6
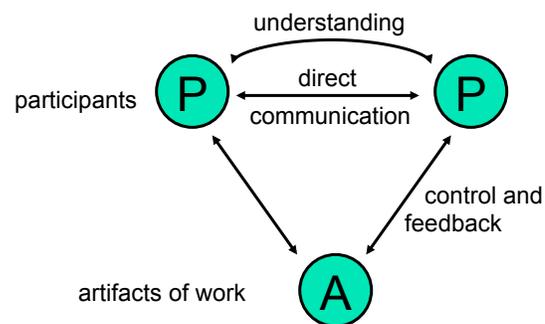
What interactions does a tool support?
Classification by primary function

meeting and decision
support systems
– common understanding

computer-mediated
communication
– direct communication
between participants

shared applications
and artifacts
– control and feedback
with shared work objects

participants

understanding

direct
communication

control and
feedback

artifacts of work

P   P

A
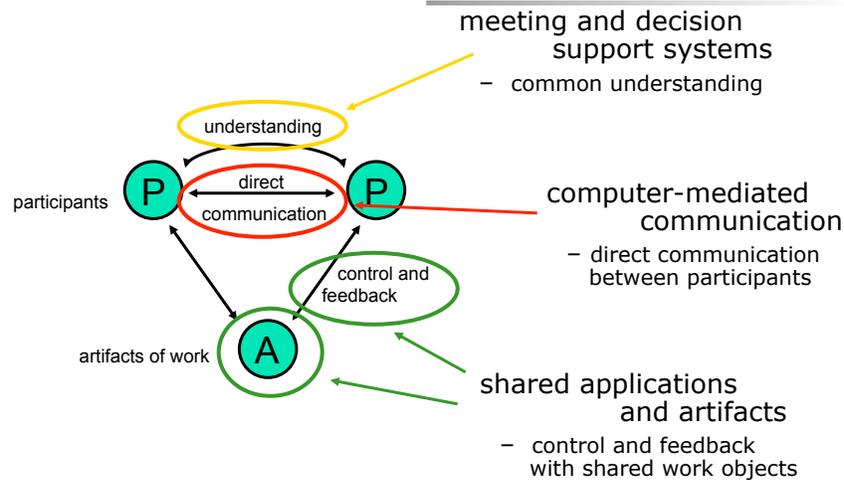
Shared Applications and Artifacts

Compare purpose of cooperation:
- meeting rooms and decison support systems
  – develop shared understanding
- shared applications and artifacts
  – work on the same objects

technology similar but primary purpose different

many different modalities (time/space matrix)
- shared windows – synchronous remote/co-located
- shared editors – synchronous remote/co-located
- co-authoring systems – largely asynchronous
- shared diaries – largely asynchronous remote
- shared information – any, but largely asynchronous

Shared editors - multiple views

Options:
- same view or different view
- single or separate insertion points

Single view
⇒ scroll wars

Multiple views
⇒ loss of context with *indexicals*

loss of WYSIWIS …

| We will look at some of the options and how they affect the style of cooperation. Thinking about the shared view vs. different view options, it at first seems obvious that we should allow people to edit different parts of a document. This is certainly true while they are working effectively independently. | | More adaptable systems are needed to allow for the wide variation between groups, and within the same group over time. We will look at some of the options and how they affect the style of cooperation. Thinking about the shared view vs. different view options, it at first seems obvious that we should allow | |

your screen   your colleague's screen

'I don't like the line at the top'
'but I just wrote that!'

Communication through the artifact

When you change a shared application:

- you can see the effect – *feedback*

- your colleagues can too – *feedthrough*

feedthrough enables …
        communication through the artifact

Examples of feedthrough?

Integrating communication and work
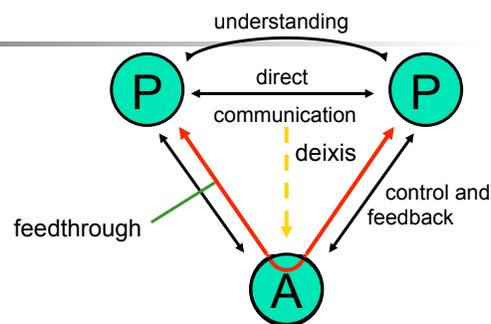
Added:
        deixis – reference to work objects
        feedthorough – for communication through the artefact
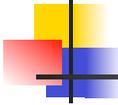
Classification by Shared information

Granularity of sharing

- chunk size
    - small – edit same word or sentence
    - large – section or whole document

- update frequency
    - frequent – every character
    - infrequent – upon explicit 'send'
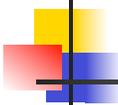
Additional dimensions of CSCW

- Participation: Open/Closed
- Governance: Hierarchical/Flat
- Work Situation or Nature of Task: Routine/Planned/Novel
- Group type: Homogeneous/diversified; newly formed (adhoc)/working group

Kinds of Awareness in Synchronous Remote CSCW?

- Social
  - Who is here? What are their roles?
- Task
  - What do I know about the task and its structure?
- Workspace
  - What are others doing?

Workspace Awareness

- What information should be captured?
- How displayed to other users?

- Same task same view (WYSIWIS)
- Same task different view
- Radar view
- Multiple WYSIWIS
  - See what others see
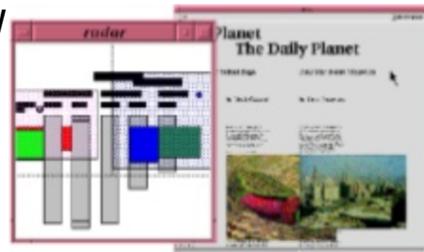
Summary: some dimensions of CSCW classification

- Place/Time
- Collaboration
  - Basic, Coordination, Cooperation, Collaboration
- Function
  - Direct communication, shared understanding, control & feedback
- Participation: Open/Closed
- Governance: Hierarchical/Flat
- Work Situation: Routine/Planned/Novel
- Group type: Homogeneous/diversified; newly formed (adhoc)/working group
- Awareness (remote/sync): Social / Task / Workspace

Classification?

Classification?

Classification?   *Coursera*

Classification? *Google docs*
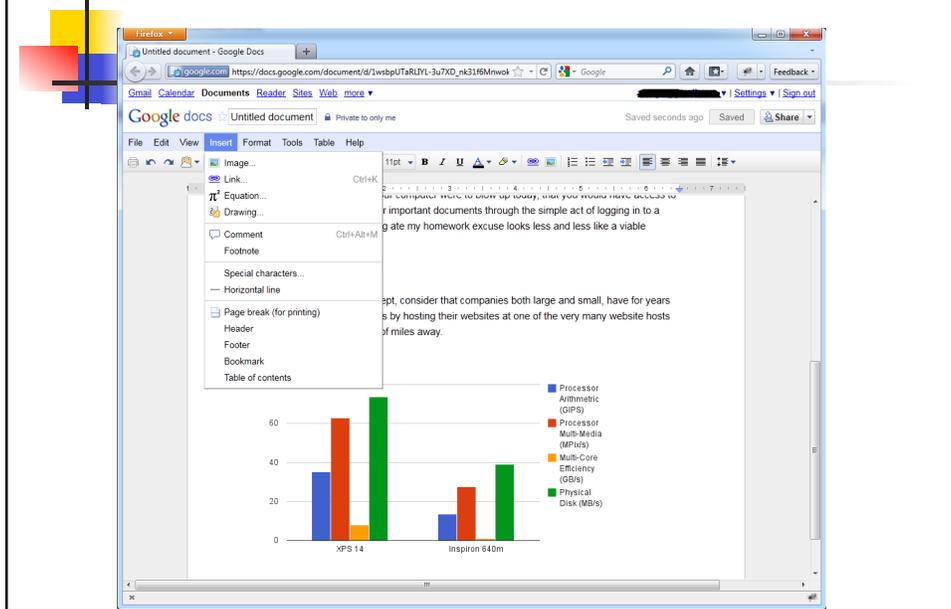
Classification? Telepresence

From Left: AnyBots QB, RoboDynamics TiLR, Gostai Jazz Connect, Mantaro's Mantaro Bot, and VGo
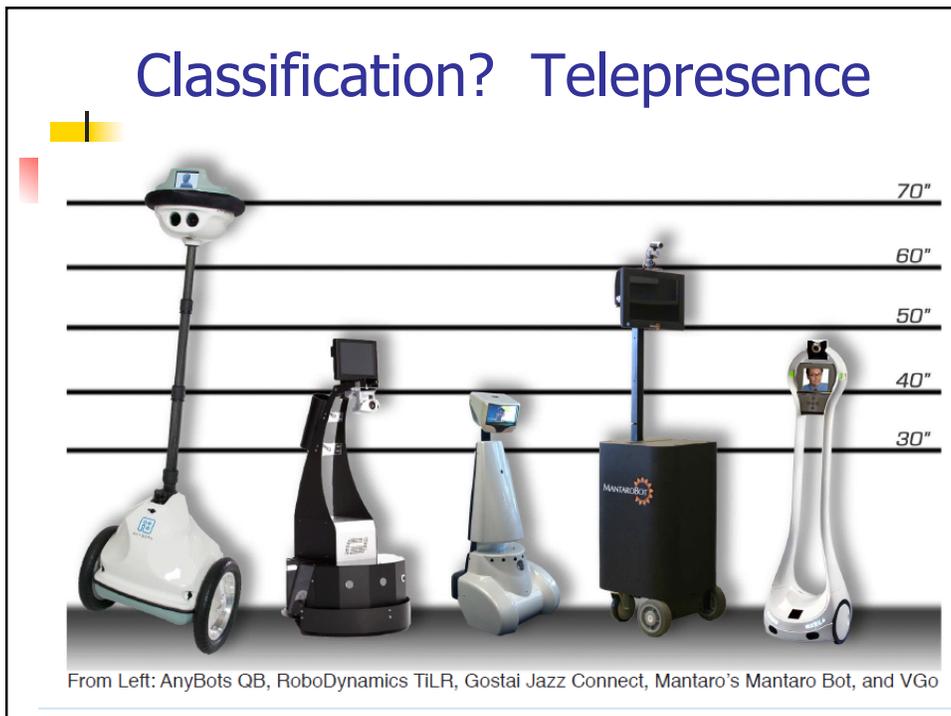
Classification?
Microsoft Surface

SOCIAL MEDIA EXPLAINED

TWITTER	I'M EATING A #DONUT
FACEBOOK	I LIKE DONUTS
FOURSQURE	THIS IS WHERE I EAT DONUTS
INSTAGRAM	HERE'S A VINTAGE PHOTO OF MY DONUT
YOUTUBE	HERE I AM EATING A DONUT
LINKEDIN	MY SKILLS INCLUDE DONUT EATING
PINTEREST	HERE'S A DONUT RECIPE
LAST FM	NOW LISTENING TO "DONUTS"
G+	I'M A GOOGLE EMPLOYEE WHO EATS DONUTS.

VIA THEMETAPICTURE.COM

Meeting and decision support systems

argumentation tools
meeting rooms
shared work surfaces

Some early research - Clearboard
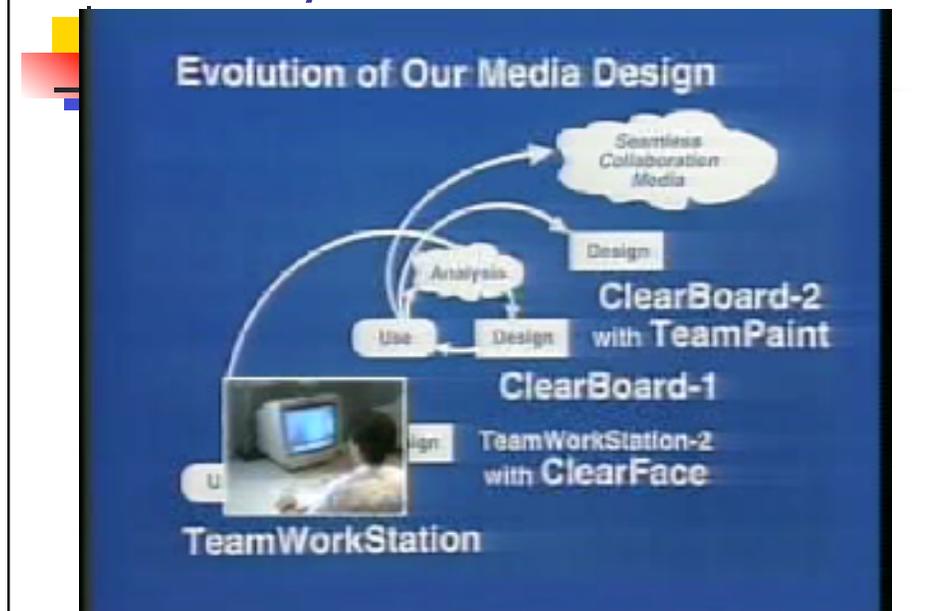
Issues for cooperation

Argumentation tools
- concurrency control
  - two people access the same node
  - one solution is node locking
- notification mechanisms
  - knowing about others' changes

Meeting rooms
- floor holders one or many?
  - floor control policies
- who can write and when?
  - solution: locking + social protocol
- group pointer
  - for deictic reference (this and that)

Now ubiquitous examples of meeting support

Implementing groupware

feedback and network delays
architectures for groupware
feedthrough and network traffic
toolkits, robustness and scaling

Feedback and network delays

screen
feedback

user types

local
machine

network

remote
machine

remote
application

⑨ ⑧ ⑦ ⑥

① ② ③ ④ ⑤
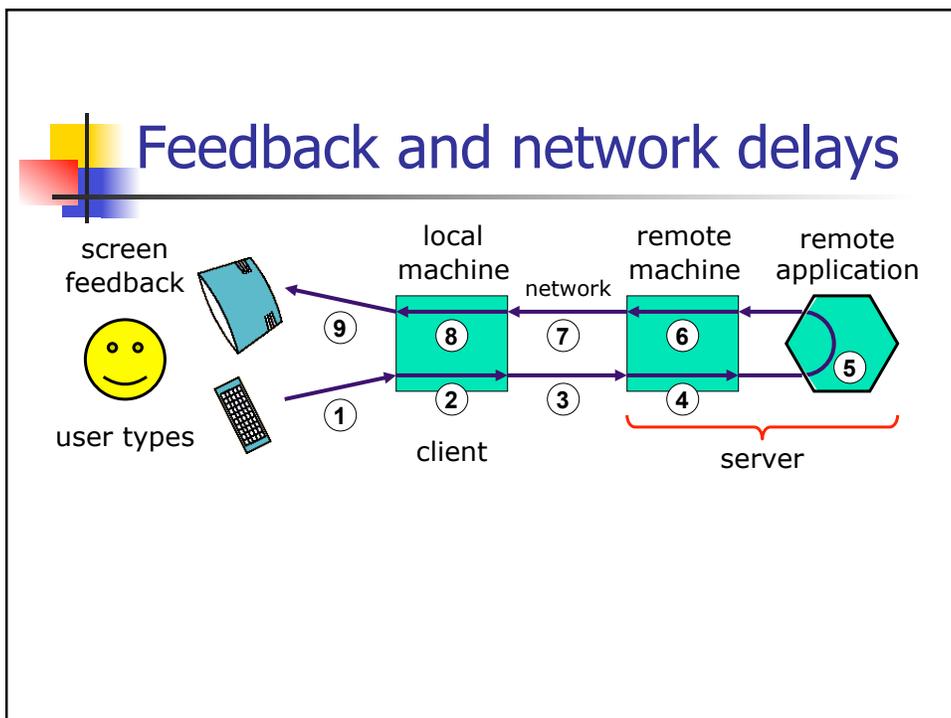
client

server

Types of architecture

centralized – single copy of application and data
- client-server – simplest case

replicated – copy on each workstation
- also called peer-peer
- + local feedback
- race conditions

Often 'half way' architectures:
- local copy of application + central database
- local cache of data for feedback
- some hidden locking

Example – Synchronous CSCW "Collaborative Virtual Environments"

- Second Life

Issues with Social Networking
SecondLife, FaceBook, etc.

- Can these technologies replace human-human interaction?
  - can you send a "handshake" or a "hug"
  - how does intimacy survive?
- Are too many social cues lost?
  - facial expressions and body language for enthusiasm, disinterest, anger
  - will new cues develop? e.g., :)

Trust in CMC (Olsens, UMich)

- Outcome:
  - Prisoner's dilemma
- Study 1
  - F2F best
  - VMC = f2f, but took longer
  - Text Chat never trust
- Study 2
  - CMC getting acquainted leads to higher trust

group payoff

| | FTF (N=14) | video (N=16) | Audio (N=16) | Text (N=16) |
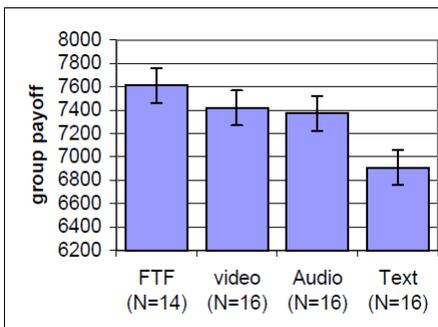
Exertion Interfaces (Mueller)

Exertion Interfaces (Mueller)
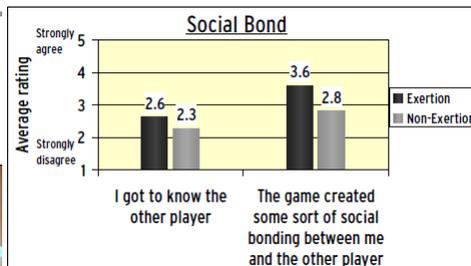
Social Bond

Qualitative self-report measures of social bonding – greater for exertion interface compared to desktop keyboard interface.

Groupware Success & Failures

Grudin

Groupware Failures

- Why does groupware fail?
  - disparity between workers & beneficiaries
  - threats to existing power structures
  - insufficient critical mass
  - violation of social taboos
  - rigidity that counters common practice or exceptions

Success/Failure of Groupware

- Depends on competing alternatives
  - collaborators down the hall or across country?
- If users are committed to system, etiquette & conventions will evolve
  - tend to arise from cultural & task background
  - users from different orgs or cultural contexts may clash
- Synchronous systems that work well for 2 users may be less effective w/ more users

CSCW Exercise

- Form teams
- Brainstorm a new groupware extension for one of your projects (10 mins)
- Sketch the UI
- Classify it

Heuristic Evaluation for Games:
Usability Principles for Video Game Design

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ABSTRACT
Most video games require constant interaction, so game designers must pay careful attention to usability issues. However, there are few formal methods for evaluating the usability of game interfaces. In this paper, we introduce a new set of heuristics that can be used to carry out usability inspections of video games. The heuristics were developed to help identify usability problems in both early and

In this paper, we define game usability as *the degree to which a player is able to learn, control, and understand a game*. Our definition is based on an early informal survey of usability problems cited in critical game reviews and on playability heuristics described by Federoff [12] and Desurvire et al. [7]. Game usability does not address issues of entertainment, engagement, and storyline, which are strongly tied to both artistic issues (e.g. voice acting,

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Homework I7
Heuristic Evaluation

- Each of you will evaluate three projects (each project gets 9 reviews).
- ASAP – check to make sure you can run the interface.
  - Contact me and the project members if any problems.
- You are to evaluate using heuristic evaluation as covered in Nielsen.
  - Answer how well the interface meets each of the criteria.
  - Write 1-2 page report on each project covering at least **10** issues (positive or negative). Clarity is important (screen shots where possible). For problems, classify them as Cosmetic, Minor, Major, or Catastrophe.
  - Post each review on a separate web page and email the relevant URL to the appropriate team members.
  - Work through the 3 tasks used in paper prototyping, unless otherwise specified

Heuristic Evaluation & I7

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Nielsen's Heuristics
1. Simple and Natural Dialogue

- "Less is More" / KISS
  - Omit extraneous info, graphics, features

Google

| Web | Images | Groups | Directory | News |

· Advanced Search
· Preferences
· Language Tools

Google Search   I'm Feeling Lucky

Advertise with Us · Business Solutions · Services & Tools · Jobs, Press, & Help

©2003 Google - Searching 3,307,998,701 web pages

Nielsen's Heuristics
2. Speak the User's Language

- Use common words, not techie jargon
  - But use domain-specific terms where appropriate
- Don't put limits on user defined names
- Allow aliases/synonyms in command languages
- Metaphors are useful but may mislead

Nielsen's Heuristics
3. Minimize User Memory Load

- Use menus, not command languages
- Use combo boxes, not textboxes
- Use generic commands where possible (Open, Save, Copy Paste)
- All needed information should be visible

Nielsen's Heuristics
4. Consistency

- Principle of Least Surprise
  - Similar things should look and act similar
  - Different things should look different
- Other properties
  - Size, location, color, wording, ordering, …
- Command/argument order
  - Prefix vs. postfix
- Follow platform standards
- Kinds of Consistency
  - Internal
  - External
  - Metaphorical

Nielsen's Heuristics
5. Feedback

- Keep user informed of system state
  - Cursor change
  - Selection highlight
  - Status bar
- Response time
  - < 0.1 s: seems instantaneous
  - 0.1-1 s: user notices, but no feedback needed
  - 1-10 s: display busy cursor or other feedback
  - > 10 s: display progress bar

11/14/16

Nielsen's Heuristics
6. Clearly Marked Exits

- Provide undo
- Long operations should be cancelable
- All dialogs should have a cancel button
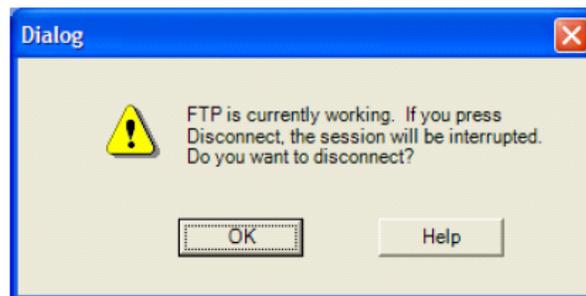
Nielsen's Heuristics
7. Shortcuts

- Provide easily-learned shortcuts for frequent operations
  - Keyboard accelerators
  - Command abbreviations
  - Styles
  - Bookmarks
  - History

Nielsen's Heuristics
8. Good Error Messages

- Be precise; restate user's input
  - Not "Cannot open file", but "Cannot open file named paper.doc"
- Give constructive help
  - why error occurred and how to fix it
- Be polite and non-blaming
  - Not "fatal error", not "illegal"
- Hide technical details (stack trace) until requested

Nielsen's Heuristics
9. Prevent Errors

- Selection is less error-prone than typing
- Disable illegal commands
- Description Error
  - different things/commands should look and act different
- Mode Error
  - Eliminate modes
  - Visibility of mode
  - Spring-loaded or temporary modes
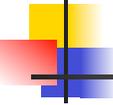
Nielsen's Heuristics
10. Help and Documentation

- Model
  1. Searching
  2. Understanding
  3. Applying
- Important features
  - Index
  - Overview map
  - Help visible while user is applying
  - Describe confirmatory feedback

Norman: Visibility

- *aka "Obviousness"*
- The correct parts must be visible.
- They must convey the correct message.
- Impacts learnability.

- How different from affordance?
- Examples?

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Tester	ON	P1	P2	P3
Altschuler, Kevin	6	4	2	7
Appleby, Noah	5	4	6	3
Bond, Nicholas (Nick)	3	8	1	2
Chen, Bo-Ren	3	8	2	6
Corbett, Jonathan (Jon)	5	7	4	6
Deschamps, Sebastian	1	6	5	8
Gimmi, Alexander	2	1	3	4
Haji-Sheikhi, Bahar	5	8	6	7
Hennessy, Daniel	7	5	8	1
Hersey, David	3	2	1	5
Krug, Kenneth (Kenny)	1	3	2	7
LaPierre, Jennifer (Jenny)	4	3	1	2
Lim, Alexander	3	4	5	6
Mathieu, Jacques	4	3	7	5
Pomerantz, Calvin	2	1	3	4
Potapov, Pavel	2	5	6	7
Sadikov, Pavel	2	8	1	3
Sayegh, Melina	5	2	7	4
Shah, Suhani	4	5	6	8
Taylor, Jacob	6	7	8	1
Tseng, Eric M.	1	2	3	4
Van Heemst, Jacob	8	5	6	7
Wetherby, Cody	8	1	2	3
Zhou, Kevin	7	8	4	5

Project	Topic	T1
1	Kenny, Eric, Sebastian	Stub hub
2	Alex G, Calvin, Pavel x 2	Textbook resale
3	Nick, David, Alex L, Bo-Ren	Multilingual JFK
4	Jenny, Jacques, Suhani	Music player
5	Noah, Jon, Bahar, Melina	MyCampus
6	Kevin A, Jacob T	OS Permissions
7	Daniel, Kevin Z	Gamified sched
8	Jacob VH, Cody	OCRemix

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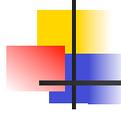
To do

- Read
    - Industry design guidelines (2 papers)
    - Accessibility (review Benyan 4.2)

- Start I7 (due 1 week)