

Lecture 6: Design Workshop – Part 2

& Evaluation Heuristic, Usability Testing & Ethics

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Administrivia

- Assignment 2
 - Posted – Due: June 29
- Assignment 3 – Will be posted this week
- Project
 - Phase II Peer Evaluations Due: **Saturday, Jun 18, 2022**
 - Phase III – Will be posted this week
- Tutorial this week
 - Use Case Reading

Creative Design Workshop - Prototype Presentations



tomorrow is
created here

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Each team should:



- Select a presenter and do a walk-through of your prototype [5-7 min]
- Class TEST/Critique (pretend to be users) [5 min]

Recap

- Design (also called (re)design)
- Prototyping

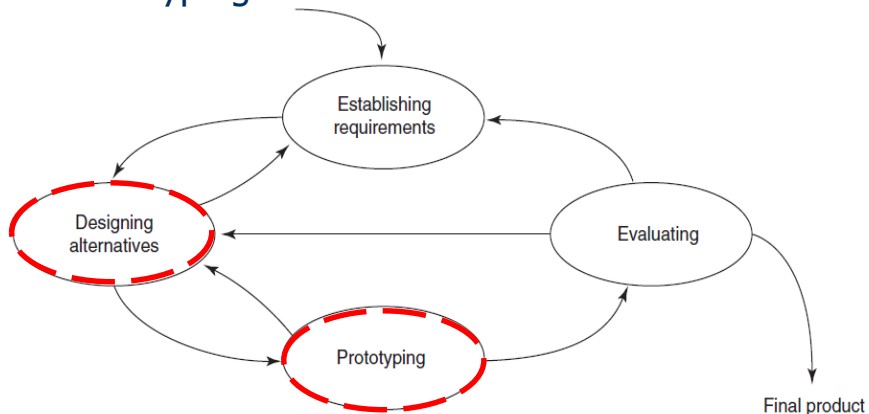


Figure 9.3 A simple interaction design lifecycle model

Imagine ...

- You have designed an app for teenagers to share music, gossip, and photos!
- You have prototyped your first design and have implemented the core functionality.
- How would you find out it would appeal to them and if they will use it?

What do you do?

The plan for today...

- **Evaluation**

- Heuristic Evaluation
- Usability Testing
- Ethics

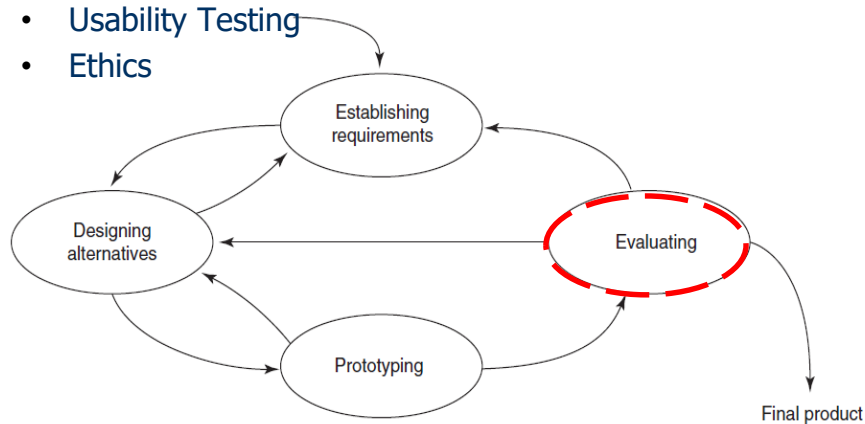


Figure 9.3 A simple interaction design lifecycle model

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Why, What, Where and When to Evaluate

- Iterative design & evaluation is a continuous process that examines:
- **Why:** to check users' requirements and that they can use the product and they like it.
- **What:** a conceptual model, early prototypes of a new system and later, more complete prototypes.
- **Where:** in natural and laboratory settings.
- **When:** throughout design; finished products can be evaluated to collect information to inform new products.

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Types of Evaluation

- 1** Controlled settings involving users, eg. usability testing & experiments in laboratories and living labs.
- 2** Natural settings involving users, eg. field studies and in the wild studies to see how the product is used in the real world.
- 3** Settings not involving users, consultants and researchers critique, predict and model aspects of the interface in order to identify usability problems. The range of methods includes heuristics, walkthroughs, models and analytics.

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Usability Testing and Laboratories

The usability lab consists of two areas: the testing room and the observation room

The testing room is typically smaller and accommodates a small number of people

The observation room, can see into the testing room typically via a one-way mirror. The observation room is larger and can hold the usability testing facilitators with ample room to bring in others, such as the developers of the product being tested



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Living Labs

- People's use of technology in their everyday lives can be evaluated in living labs.
- Such evaluations are too difficult to do in a usability lab.
- Eg. the Aware Home was embedded with a complex network of sensors and audio/video recording devices (Abowd et al., 2000).



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Data Gathering Methods

- **Surveys:**
 - User background (age, gender, origins, education, income)
 - Experience with computers (specific applications or software packages, length of time, depth of knowledge)
 - Job responsibilities (decision-making influence, managerial roles, motivation)
 - Personality style (introvert or extrovert, risk taking or risk averse, early or late adopter, systematic or opportunistic)
 - Reasons for not using an interface (inadequate services, too complex, too slow)
 - Familiarity with features (printing, macros, shortcuts, tutorials)
 - Feeling state after using an interface (confused or clear, frustrated or in-control, bored or excited)

Examples of the specific satisfaction scale questions:													
5.4	Messages which appear on display:	confusing	clear	1	2	3	4	5	6	7	8	9	NA
5.4.1	Instructions for commands or choice:	confusing	clear	1	2	3	4	5	6	7	8	9	NA

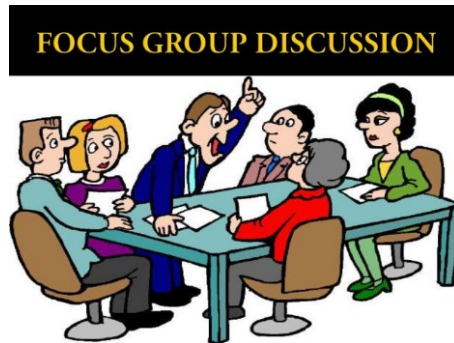
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Data Gathering Methods

• Interviews and focus group discussions

- Interviews with individual users can be productive because the interviewer can pursue specific issues of concern
- Group discussions are valuable to ascertain the universality of comments



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Usability Testing

- Videotaping participants performing tasks is often valuable for later review and for showing designers or managers the problems that users encounter
 - Use caution in order to not interfere with participants
 - Invite users to think aloud (sometimes referred to as concurrent think aloud) about what they are doing as they are performing the task
- Many variant forms of usability testing have been tried:
 - Paper mockups
 - Discount usability testing
 - Competitive usability testing
 - A/B testing
 - Universal usability testing
 - Field test and portable labs
 - Remote usability testing
 - Can-you-break-this tests
 - Think-aloud and related techniques
- Usability test reports

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Informed Consent Form

- Participants need to be told why the evaluation is being done, what they will be asked to do, their rights and any risks.
- Informed consent forms provide this information.
- Participation should be voluntary and informed consent should be obtained
- The design of the informed consent form, the evaluation process, data analysis and data storage methods are typically approved by a high authority, eg. Institutional Review Board (Ethics).

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Informed Consent Form

- Professional ethics practice is to ask all subjects to read and sign a statement like this:
 - I have freely volunteered to participate in this experiment.
 - I have been informed in advance what my task(s) will be and what procedures will be followed.
 - I have been given the opportunity to ask questions, and have had my questions answered to my satisfaction.
 - I am aware that I have the right to withdraw consent and to discontinue participation at any time, without prejudice to my future treatment.
 - My signature below may be taken as affirmation of all the above statements; it was given prior to my participation in this study.

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University of Toronto – Research Ethics Board (REB)



Research and Innovation

Search this site:

Type and hit enter to search

Faculty and Staff

Secure Research Funding

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Protections

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Learn About U of T Research

About the Office

Research and Innovation > Faculty and Staff > Research Ethics and Protections > Humans in Research

Humans in Research

Research involving human participants conducted by faculty members and graduate students under the auspices of the University of Toronto **must be reviewed and approved by a University of Toronto Research Ethics Board (REB)** prior to its commencement.

All of the Toronto Academic Health Sciences Network (TAHSN) hospitals have their own, independent REBs. All hospital-based researchers must submit human participant research protocols to their respective hospital REB for review, and to the REBs of all hospitals involved in the research. Researchers should also submit protocols to their appropriate University of Toronto REB if recruitment, intervention or interaction with human participants will be done on campus. For hospital-based projects where U of T plays a peripheral role, please see Administrative Review, below.

Governance

Oversight of the Human Research Protections Program at the University of Toronto is through the Research Ethics Policy and Advisory Committee (REPAC), which is charged with developing policies and guidelines in compliance with the Tri-Council Policy Statement: Ethical Conduct for Research Involving Humans (2010). It also advises the VP, Research and Innovation and other senior administrators on matters related to human research.

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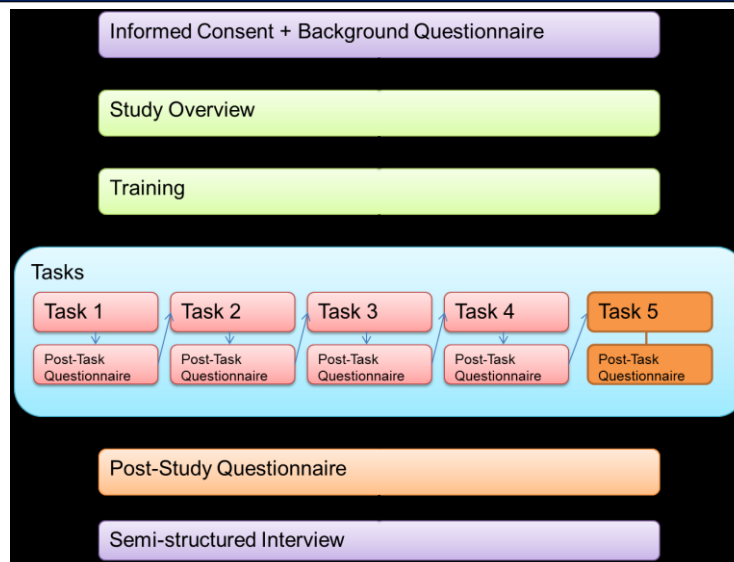
- Governance
- Consults and Training

<http://www.research.utoronto.ca/faculty-and-staff/research-ethics-and-protections/humans-in-research>

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Example: Usability Study Design



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Usability Testing: Data Collection

- Continuous user-performance data logging

The software architecture should make it easy for system managers to collect data about:

- The patterns of system usage
- Speed of user performance (how long it is taking to perform the task)
- Rate of errors
- Frequency of request for online assistance

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Usability Testing: Data Collection

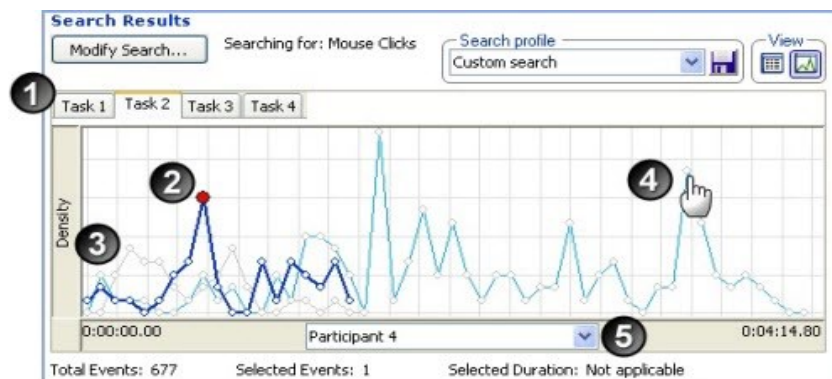
Example output of an automated evaluation tool from TechSmith's Morae

The item being measured is mouse clicks.

This shows the view for task 2 (selected in the tabbed bar). Obviously, the other 3 tasks could also be displayed. These are the values for participant 4.

The drop down list box would allow the evaluator to choose the mouse clicks for other participants.

Across the horizontal axis time is shown



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Natural Setting - Observation

- Eye-tracking software is attached to the airline check-in kiosk
 - It allows the designer to collect data observing how the user “looks” at the screen
 - This helps determine if various interface elements (e.g. buttons) are difficult (or easy) to find



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Sample Case Studies

- In the wild field study of skiers



(a)



(b)

Figure 13.4 (a) A skier wearing a helmet with an accelerometer (dark red box) and a mini-camera (black cylinder) placed on it for assessing the skier's performance and (b) the smartphone that provides feedback to the skier in the form of visualizations

Source: Jambon and Meillon (2009) User experience in the wild. In: *Proceedings of CHI '09*, ACM Press, New York, p. 4070.

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1 2

Usability Testing & Field Studies

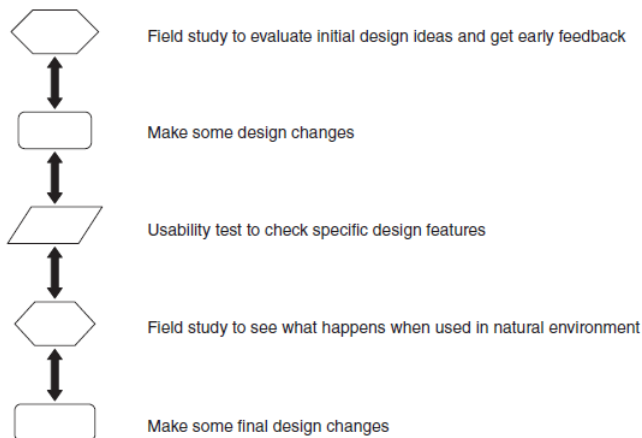


Figure 13.1 Example of the way laboratory-based usability testing and field studies can complement each other

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Expert Reviews & Heuristics

- While informal demos to colleagues or customers can provide some useful feedback, more formal expert reviews have proven to be effective
- Expert reviews entail one-half day to one week effort, although a lengthy training period may sometimes be required to explain the task domain or operational procedures
- There are a variety of expert review methods to choose from:
 - **Heuristic evaluation**
 - Guidelines review
 - Consistency inspection
 - **Cognitive walkthrough**
 - Formal usability inspection

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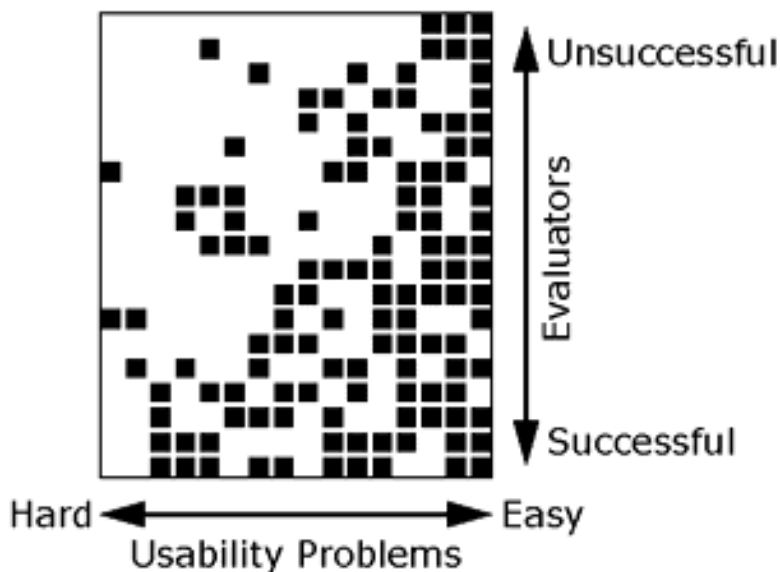
Heuristic Evaluation

- **Heuristic evaluation** is a review guided by a set of recognized usability principles (the "heuristics").
- Usability inspection method developed by **Jacob Nielsen** in the early 1990s.
- Based on heuristics distilled from an empirical analysis of 249 usability problems.
- These heuristics have been revised for current technology by Nielsen and others for:
 - mobile devices, wearables, virtual worlds, etc.

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Evaluators & Problems



<https://www.nngroup.com/articles/how-to-conduct-a-heuristic-evaluation/>

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No. of Evaluators & Problems

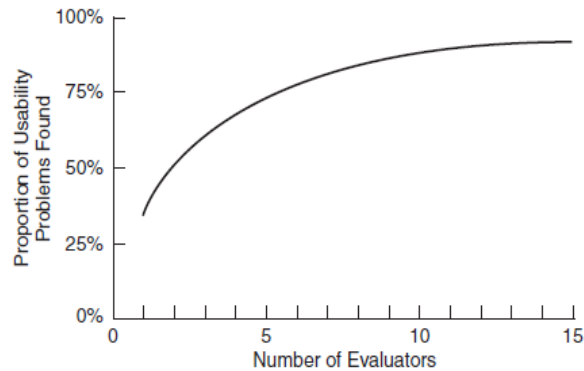


Figure 15.1 Curve showing the proportion of usability problems in an interface found by heuristic evaluation using various numbers of evaluators. The curve represents the average of six case studies of heuristic evaluation

Source: Usability Inspection Methods, J. Nielsen & R.L. Mack ©1994. Reproduced with permission of John Wiley & Sons Inc.

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No. of Evaluators & Problems

- Nielsen suggests that on average 5 evaluators identify 75-80% of usability problems.
- Cockton and Woolrych (2001) point out that the number of users needed to find 75-80% of usability problems depends on the context and nature of the problems.

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Heuristic Evaluation (10) by Nielsen (1994)

1. Visibility of system status.
2. Match between system and real world.
3. User control and freedom.
4. Consistency and standards.
5. Error prevention.
6. Recognition rather than recall.
7. Flexibility and efficiency of use.
8. Aesthetic and minimalist design.
9. Help users recognize, diagnose, recover from errors.
10. Help and documentation.

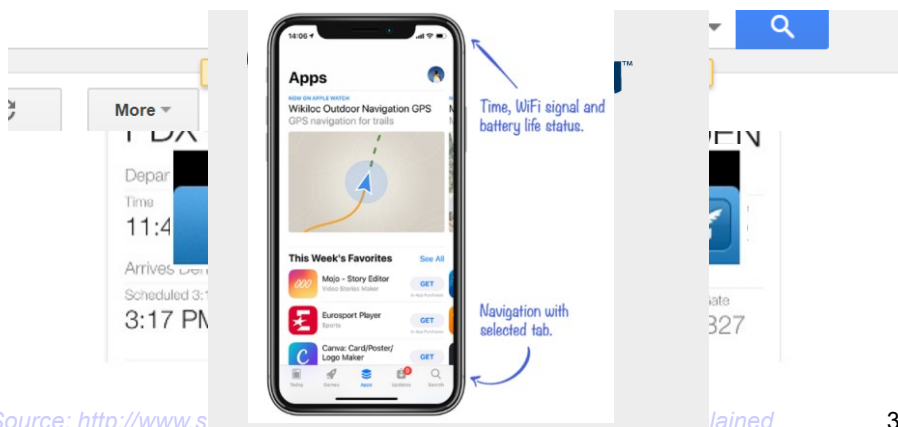
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1. Visibility of System Status



- The system should always keep users informed about what is going on, through appropriate feedback within reasonable time.



Source: <http://www.s>

ained

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2. Match between system and the real world

- The system should speak the users' language, with words, phrases, and concepts familiar to the user, rather than system-oriented terms. Follow real-world conventions, making information appear in a natural and logical order.



Refrain from confusing people with system oriented language and design.

oops, there is a problem

Target.com requires **cookie** to be enabled.

continue if enabled



Great examples of real world matching icons

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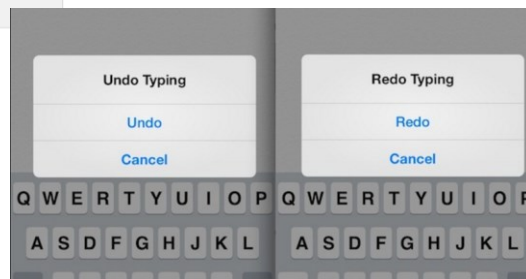
3. User control and freedom



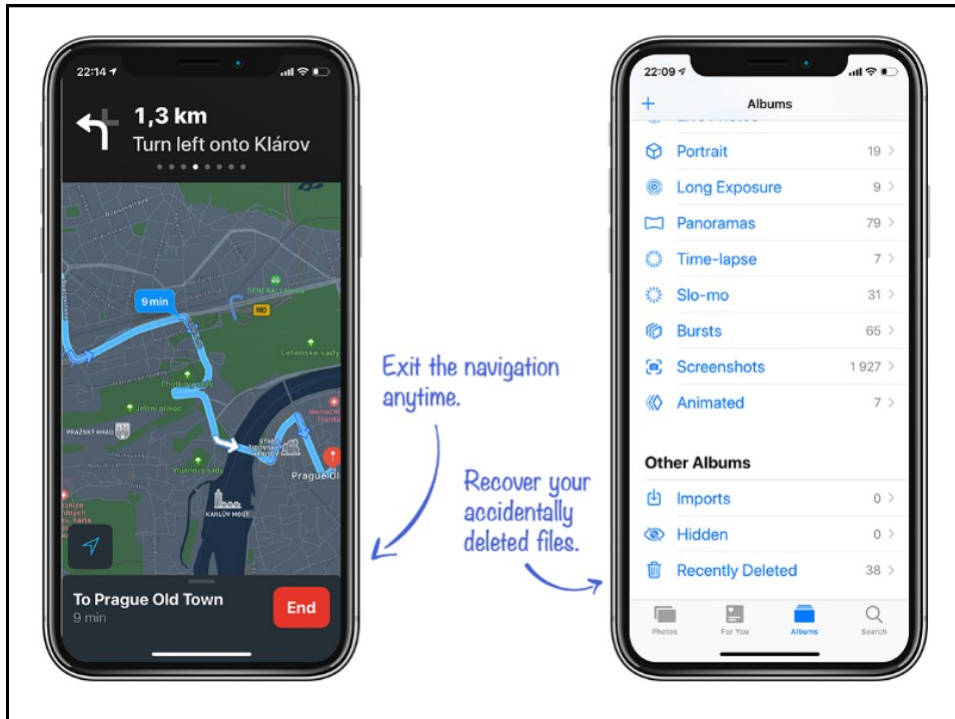
- Users often choose system functions by mistake and will need a clearly marked emergency exit to leave the unwanted state without having to go through an extended dialog.
- Support undo and redo.

Google

Gmail ▾

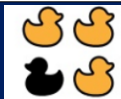


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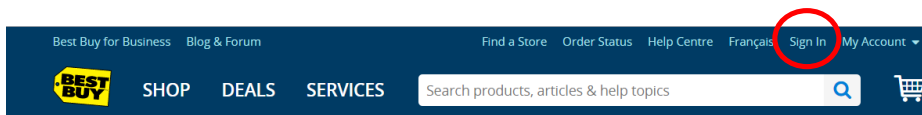


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4. Consistency and Standards



- Users should not have to wonder whether different words, situations, or actions mean the same thing.
- Follow platform conventions

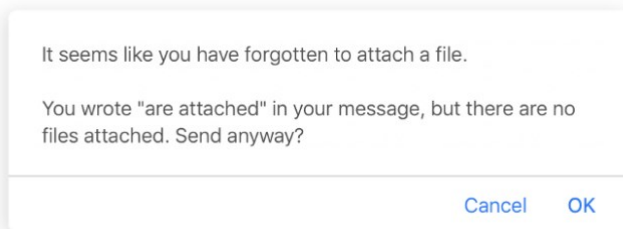


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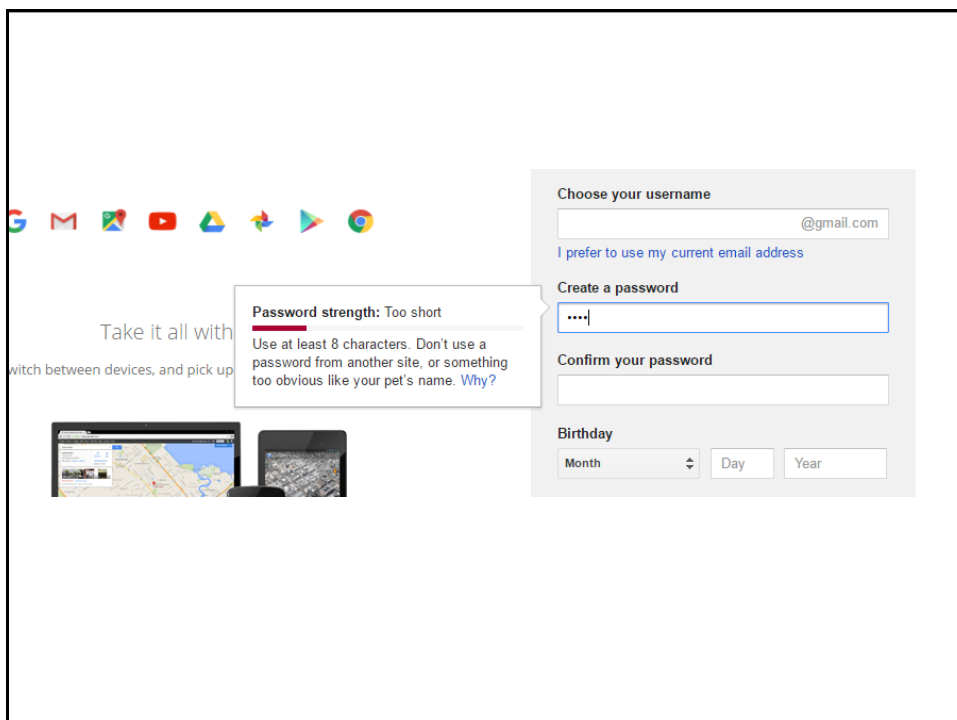
5. Error Prevention

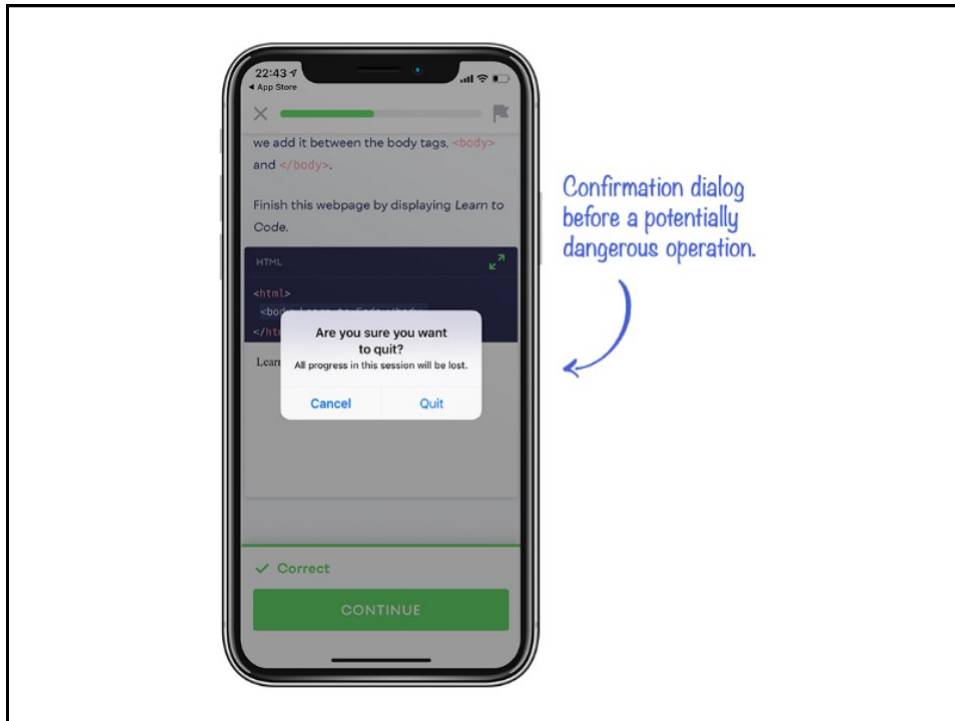


- Even better than good error messages is a careful design that prevents a problem from occurring in the first place.
- Either eliminate error-prone conditions or check for them and present users with a conformation option before they commit to the action.



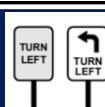
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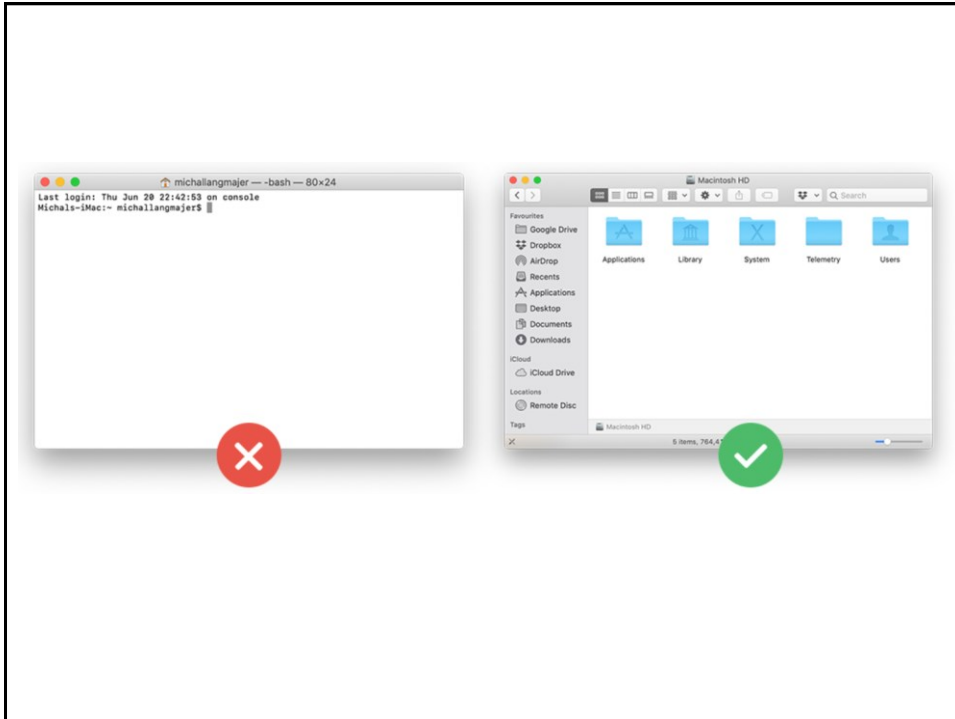
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6. Recognition rather than recall



- Minimize the user's memory load by making objects, actions and options visible. The user should not have to remember information from one part of the dialog to another.





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7. Flexibility and efficiency of use



- Accelerators – unseen by novice users – may often speed up the interaction for the expert user such that the system can cater to both inexperienced and experienced users. Allow users to tailor frequent actions.

Advanced Image Search

Find images with...

all these words:

this exact word or phrase:

any of these words:

none of these words:

To do this in the search box.

Type the important words: winter, heart, frost

Put exact words in quotes: "Tweed Flower"

Type OR between all the words you want: trees OR woods OR grasses

Put a minus sign just before words that you don't want: windows

Then narrow your results by...

image size:

Find images in any size you need

aspect ratio:

Specify the shape of images

colours in the image:

Find images in your preferred colours

type of image:

Limit the kind of images that you find

region:

Find images published in a particular region

site or domain:

Search one site (like www.ck12.org) or limit your results to a domain like edu.ck12.org

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8. Aesthetic and minimalist design.



- Dialogs should not contain information that is irrelevant or rarely needed. Every extra unit of information in a dialog competes with the relevant units of information and diminishes their relative visibility.

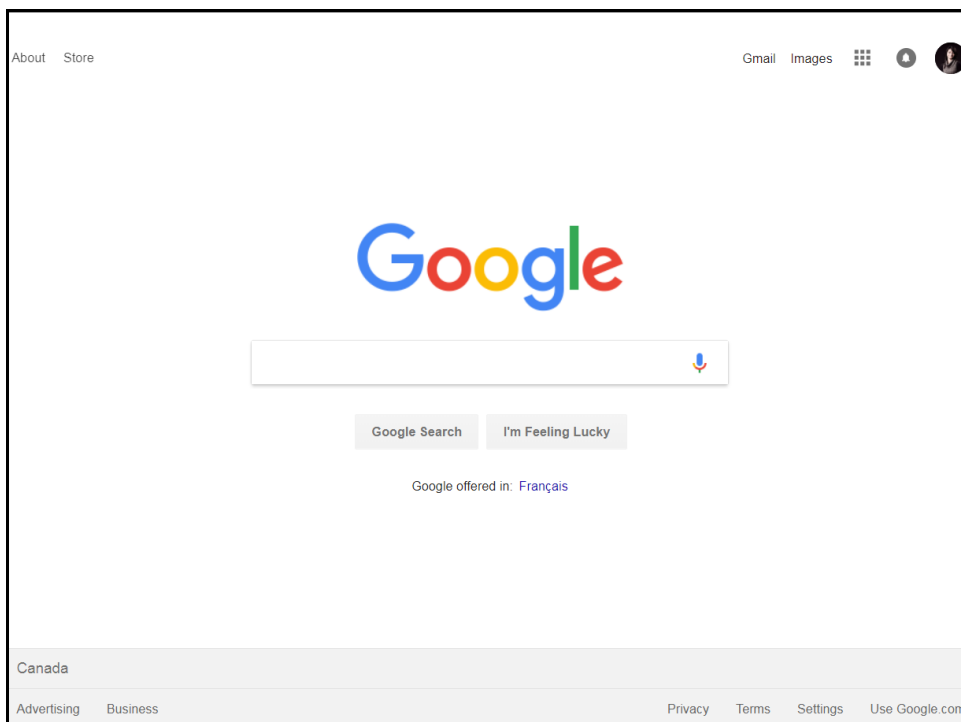


Avoid overloading the interface with features. Examine every element and ask - is this really needed?



Source: <http://www.slideshare.net/crafted/10-usability-heuristics-explained>

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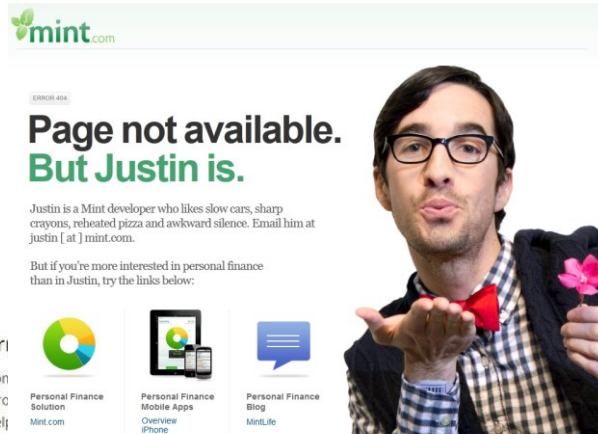


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9. Help users recognize, diagnose, recover from errors



- Error messages should be expressed in plain language (no codes), precisely indicate the problem, and constructively suggest a solution.



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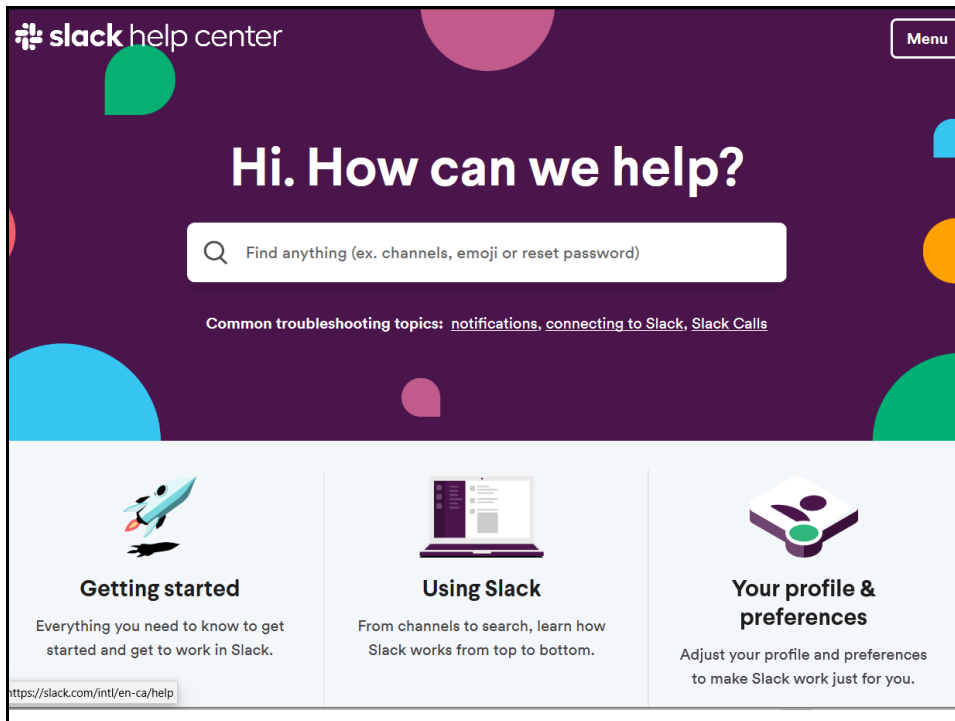
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10. Help and documentation



- Even though it is better if the system can be used without documentation it may be necessary to provide help and documentation. Any such information should be easy to search, focused on the user's task, list concrete steps to be carried out, and not be too large..

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Heuristic Evaluation (10) by Nielsen (1994)

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Steps in Heuristic Evaluation

1. Have a list of heuristics
2. Briefing session to tell experts what to do.
3. Evaluation period of 1-2 hours in which:
 1. Each expert works separately;
 2. Take one pass to get a feel for the product;
 3. Take a second pass to focus on specific features/identify problems.

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Steps in Heuristic Evaluation (cont'd)

3. Match each problem with the corresponding heuristic broken.
4. Report each problem separately
5. Confer with other evaluators: debriefing session in which experts work together to prioritize problems.

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3

Advantages & Disadvantages

- Few ethical & practical issues to consider because users **not** involved.
- Can be difficult & expensive to find experts.
- Best experts have knowledge of application domain & users.
- Biggest problems:
 - Important problems may get missed;
 - Many trivial problems are often identified;
 - Experts have biases.

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Cognitive Walkthroughs

- Focus on ease of **learning**.
- Designer presents an aspect of the design & usage scenarios.
- Expert is told the assumptions about user population, context of use, **task** details.
- One or more experts walk through the design prototype with the scenario.
- Experts are guided by 3 questions.

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Cognitive Walkthroughs – 3 Questions

- Will the correct action be sufficiently evident to the user?
- Will the user notice that the correct action is available?
- Will the user associate and interpret the response from the action correctly?

As the experts work through the scenario they note problems.

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Evaluation using analytics

- A method for evaluating user traffic through a system or part of a system.
- Many examples: Google Analytics (chapter 7), Visistat, Learning Analytics.
- Times of day & visitor IP addresses

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Things to consider when interpreting data

- **Reliability:** does the method produce the same results on separate occasions?
- **Validity:** does the method measure what it is intended to measure?
- **Ecological validity:** does the environment of the evaluation distort the results?
- **Biases:** Are there biases that distort the results?
- **Scope:** How generalizable are the results?

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1 2 3

Key Points

- **Evaluation** and **design** are very closely integrated.
- Some of the same data gathering methods are used in evaluation as for establishing requirements and identifying users' needs, e.g. observation, interviews, and questionnaires.
- Evaluations can be done in controlled settings such as **laboratories**, less controlled **field settings**, or where **users are not present**.
- **Usability testing** and experiments enable the evaluator to have a high level of control over what gets tested, whereas evaluators typically impose little or no control on participants in field studies.

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1 2 3

Key Points

- User testing & heuristic evaluation may reveal different usability problems.
- Design guidelines can be used to develop heuristics
- Walkthroughs are focused so are suitable for evaluating small parts of a product.
- Analytics involves **collecting data** about users activity on a website or product

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Next Weeks

- No Class -> Reading Week
- Assignment 2 Presentations – June 29th

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