User-centred evaluation of interactive systems

CS-C3120 Human-Computer Interaction

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Why user-centred evaluation?

- Collect new information about user needs
- Provide feedback on strengths and weaknesses of the design solution in order to improve the design
- Final acceptance: assess / confirm whether user requirements have been achieved
- Establish baselines or make comparisons between designs

When generic or consumer products are being developed, the user population is dispersed and products can be targeted at groups of users with particular characteristics. It is still important that users or appropriate representatives be involved in development so that the user and task requirements relevant to the intended user group(s) can be identified for inclusion in the system specification to provide feedback through testing of the proposed design solutions.

5.4 The design is driven and refined by user-centred evaluation

Feedback from users is a critical source of information in human-centred design. Evaluating designs with users and improving them based on their feedback provides an effective means of minimizing the risk of a system not meeting user or organizational needs (including those requirements that are hidden or difficult to specify explicitly). Such evaluation allows preliminary design solutions to be tested against "real world" scenarios, with the results being fed back into progressively refined solutions. User-centred evaluation should also take place as part of the final acceptance of the product to confirm that requirements have been met. Feedback from users during operational use identifies long-term issues and provides input to future design.

NOTE   The term "user-centred" is used here to emphasize that this evaluation is made from the user's perspective.

5.5 The process is iterative

The most appropriate design for an interactive system cannot typically be achieved without iteration.

How user-based evaluation?

Approaches and methods:

- User-based testing

- Inspection-based evaluation

- Long-term monitoring (vs. short-term evaluation)

(ISO 9241-210, 2019)

Methods for evaluation

- Usability inspections
  - E.g. heuristic evaluation, cognitive walkthrough
- User testing
  - Usability test
    - Test moderator
    - Thinking aloud
  - Modifications
    - Paired user testing
    - Contextual walkthrough
  - Questionnaires, interviews, observations

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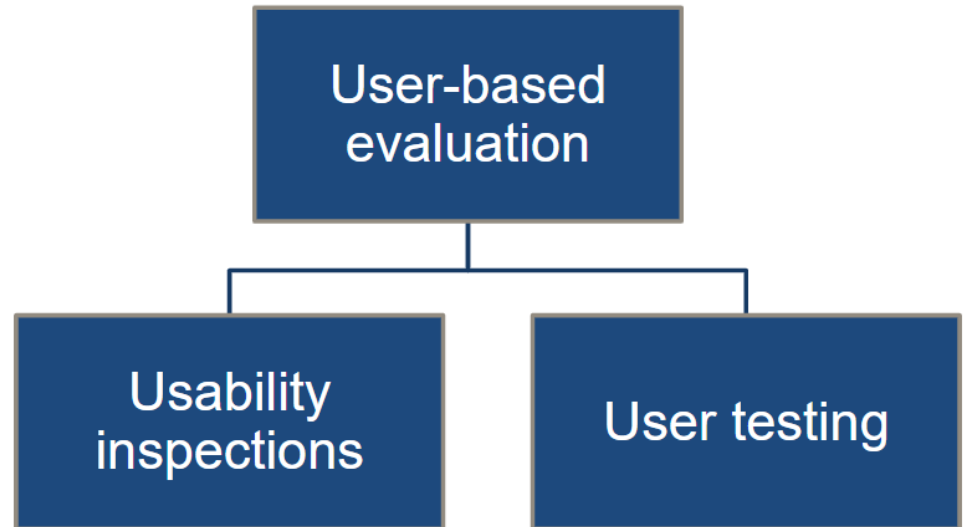
User-based testing

- Any stage in the design
- At the early stage: models, scenarios, sketches of the design concepts are presented to users and they as asked to evaluate them in relation to real context
- Testing prototypes: users should carry out tasks using the prototype
- At a later stage, user-based testing can be carried out to assess whether usability objectives have been met in the intended context of use
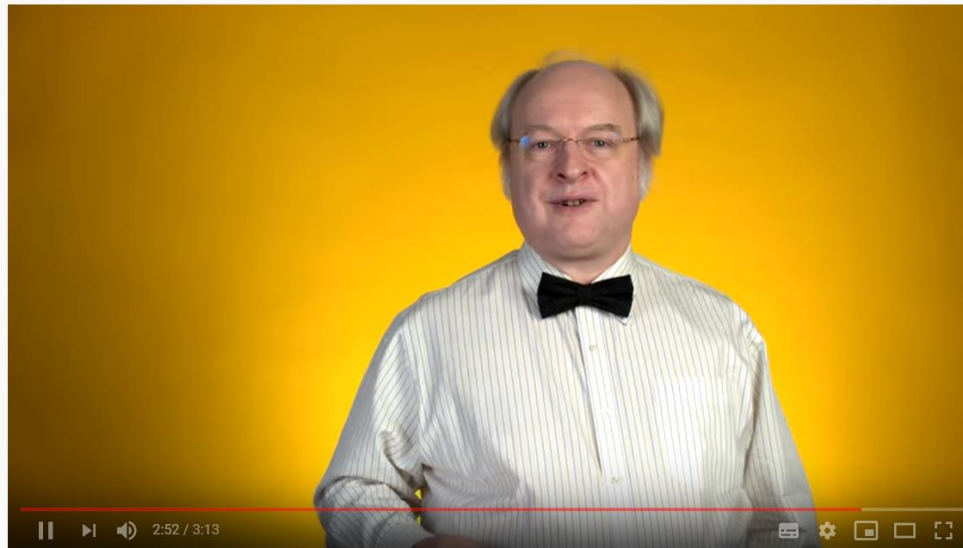
Usability attributes

"Usability has multiple components and is traditionally associated with five usability attributes:

- *Learnability*: The system should be easy to learn so that the user can rapidly start getting some work done with the system.
- *Efficiency*: The system should be efficient to use, so that once the user has learned the system, a high level of productivity is possible.
- *Memorability*: The system should be easy to remember, so that the casual user is able to return to the system after some period of not having used it, without having to learn everything all over again.
- *Errors*: The system should have a low error rate, so that users make few errors during the use of the system, and so that if they do make errors they can easily recover from them. Further, catastrophic errors must not occur.
- *Satisfaction*: The system should be pleasant to use, so that users are subjectively satisfied when using it; they like it.
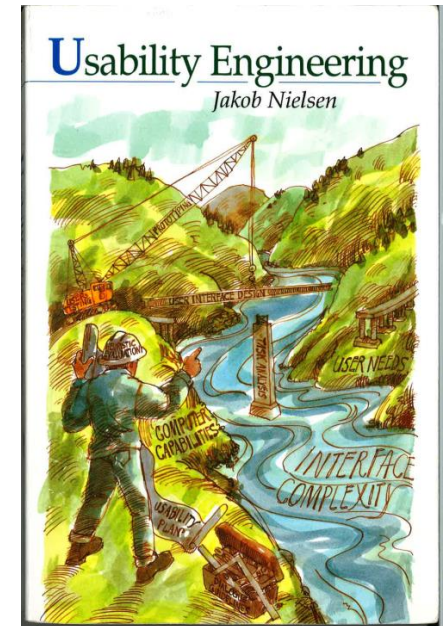
Nielsen J. (1994) Usability Engineering, Morgan Kaufmann Publishers. Available: https://dl.acm.org/doi/book/10.5555/2821575

User Testing: Why & How (Jakob Nielsen)

https://youtu.be/v8JJrDvQDF4

Traditional usability test

- Controlled test environment

- One user at a time

- Thinking aloud

- <u>Pre-defined test tasks</u>

- Moderator
  - Creating a relaxed rapport with the user

- Functional prototype or system

- Test session about 1-1,5 hours (including interviews, questionnaires etc.)

Procedure of the evaluation study

- Design and preparation
  - The overall goal of the evaluation
  - More specific goals for selected attributes (usability and UX)
  → These goals affect the selection of methods, test participants, the number of test users and the set of test tasks.

- Conducting test sessions
  - Suggestion: 5 test users are required for discovering about 80% of usability problems
  - The participants should represent the real users as well as possible
  - Sessions as similar as possible for all test participants
  - Interaction between the moderator and the test users: Avoid biasing the users' performance

- Analysing and reporting the results

Ethical considerations
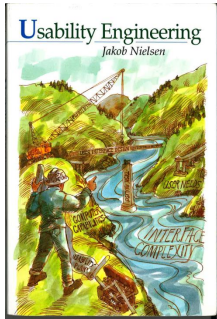
Nielsen J. (1994) Usability Engineering,
Morgan Kaufmann Publishers.
Available
online: https://dl.acm.org/doi/book/10.5555/2821575

Usability Engineering

Before the test:
Have everything ready before the user shows up.
Emphasize that it is the *system* that is being tested, not the user.
Acknowledge that the software is new and untested, and may have problems.
Let users know that they can stop at any time.
Explain any recording, keystroke logging, or other monitoring that is used.
Tell the user that the test results will be kept completely confidential.
Make sure that you have answered all the user's questions before proceeding.

During the test:
Try to give the user an early success experience.
Hand out the test tasks one at a time.
Keep a relaxed atmosphere in the test room, serve coffee and/or have breaks.
Avoid disruptions: Close the door and post a sign on it. Disable telephone.
Never indicate in any way that the user is making mistakes or is too slow.
Minimize the number of observers at the test.
Do not allow the user's management to observe the test.
If necessary, have the experimenter stop the test if it becomes too unpleasant.

After the test:
End by stating that the user has helped you find areas of improvement.
Never report results in such a way that individual users can be identified.
Only show videotapes outside the usability group with the user's permission.

Table 9 *Main ethical considerations for user testing.*

Analysing and reporting evaluation results

- Analysis of the data

- Rating the severity of the usability problems

- Description of the main usability problems

- Ideas of improvements

0 = this is not a usability problem at all

1 = cosmetic problem only—need not be fixed unless extra time is available on project

2 = minor usability problem—fixing this should be given low priority

3 = major usability problem—important to fix, so should be given high priority

4 = usability catastrophe—imperative to fix this before product can be released

Inspection-based evaluation

Heuristic evaluation method

Links:

10 Usability Heuristics for User Interface Design, available:
https://www.nngroup.com/articles/ten-usability-heuristics/

Summary: Jakob Nielsen explains the heuristic evaluation method, which allows you to judge a user interface design based on 10 well-proven general principles for human-computer interaction.

Heuristic Evaluation of User Interfaces

3 minute video by Jakob Nielsen
Topics: Heuristic Evaluation

Share this article:

https://youtu.be/6Bw0n6Jvwxk

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Nielsen Norman Group

Jakob's Ten Usability Heuristics

1 Visibility of System Status

Designs should *keep users informed* about what is going on, through appropriate, timely feedback.

Interactive mall maps have to show people where they currently are, to help them understand where to go next.

2 Match between System and the Real World

The design should speak the users' language. Use words, phrases, and concepts *familiar to the user,* rather than internal jargon.

Users can quickly understand which stovetop control maps to each heating element.

3 User Control and Freedom

Users often perform actions by mistake. They *need a clearly marked "emergency exit"* to leave the unwanted action.

Just like physical spaces, digital spaces need quick "emergency" exits too.
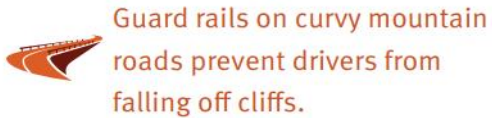
4 Consistency and Standards

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

Check-in counters are usually located at the front of hotels, which meets expectations.
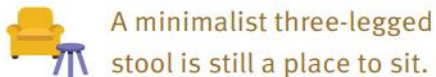
5 Error Prevention

Good error messages are important, but the best designs carefully *prevent problems* from occurring in the first place.

Guard rails on curvy mountain roads prevent drivers from falling off cliffs.

6 Recognition Rather Than Recall

Minimize the user's memory load by making elements, actions, and options visible. Avoid making users remember information.

People are likely to correctly answer "Is Lisbon the capital of Portugal?".

7 Flexibility *and* Efficiency of Use

Shortcuts — hidden from novice users — may *speed up the interaction* for the expert user.

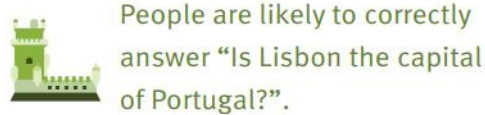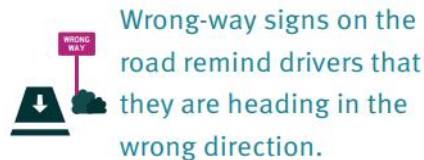Regular routes are listed on maps, but locals with more knowledge of the area can take shortcuts.

8 Aesthetic *and* Minimalist Design

Interfaces should not contain information which is irrelevant. Every extra unit of information in an interface *competes* with the relevant units of information.

A minimalist three-legged stool is still a place to sit.

9 Recognize, Diagnose, *and* Recover from Errors

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

WRONG WAY

Wrong-way signs on the road remind drivers that they are heading in the wrong direction.

10 Help *and* Documentation

It's best if the design *doesn't need* any additional explanation. However, it may be necessary to provide documentation to help users complete their tasks.

Information kiosks at airports are easily recognizable and solve customers' problems in context and immediately.

NN/g

The procedure of heuristic evaluation

1. Each evaluator inspects individually, with at least two passes

2. The results of the evaluators are aggregated in group

3. Rate the severity of the found problems

4. Report and illustrate the found problems (especially the most severe ones)

5. Generate and describe improvement suggestions

6. Write the report and prepare to present the findings

Inspection-based vs user-based evaluation

Inspection based evaluation

- Performed by usability experts

- To eliminate major issues before user testing

- Can be supported by checklists, lists of user requirements, general usability guidance, industry best practices, usability heuristics, guidelines or standards

- Can complement user testing

- Simpler and quicker to carry out than user testing

"Usability testing with real users is the most fundamental usability method and is in some sense irreplaceable, since it provides direct information about how people use computers and what their exact problems are with the concrete interface being tested."

(Jakob Nielsen, 1993, Usability Engineering)

Usability questionnaires

- Focus on a selected software, system or workstation
- Evaluate the usability of user interface
- Are context and domain independent

Examples of standardized usability questionnaires:

- SUS (System Usability Scale)
- SUMI (Software Usability Measurement Inventory)
- QUIS (Questionnaire for User Interaction Satisfaction)
- USE (Usefulness, Satisfaction, and Ease of Use)

Measuring Usability: From the SUS to the UMUX-Lite

Jeff Sauro, PhD
October 11, 2017

UMUX

In response to the need for a shorter questionnaire, Finstad introduced[pdf] the Usability Metric for User Experience (UMUX) in 2010. It's intended to be similar to the SUS but is shorter and targeted toward the ISO 9241 definition of usability (effectiveness, efficiency, and satisfaction). It contains two positive and two negative items with a 7-point response scale. The four items are:

[This system's] capabilities meet my requirements.

Using [this system] is a frustrating experience.

[This system] is easy to use.

I have to spend too much time correcting things with [this system].

Welcome!

CS-E5230 –

Collaborative evaluation of interactive systems
Spring 2023 (IV and V periods)

LEARNING OUTCOMES: After the course, you can select methods for collaborative evaluation of usability and user experience. You are able to design and carry out an evaluation of interactive systems in different contexts. You know how to communicate your results to various stakeholders in order to impact the further development of the system or service.

CONTENT: The course introduces several methods for collaborative evaluation of interactive systems. The methods for evaluation of usability and user experience are applied in project works conducted in cooperation with customers. Findings further the development of the evaluated interactive system or service.

DESCRIPTION OF PREREQUISITES
CS-E4900 User-Centred Methods for Product and Service Design or equivalent knowledge in user-centred design and usability.

Assignment 5: 10 Usability Heuristics

A. Get familiar with ten usability heuristics for user interface design. Refs:

- 10 Usability Heuristics for User Interface Design, available online: https://www.nngroup.com/articles/ten-usability-heuristics/

- Nielsen J. (1994) Usability Engineering, Morgan Kaufmann Publishers.

    Available online: https://dl.acm.org/doi/book/10.5555/2821575

B. Create your own example document:

1. Select a digital service.

2. Get familiar with the services and review those utilizing the ten usability heuristics by Nielsen. Concerning each of the ten heuristics, find examples of good design solutions and potential usability problems.

3.Report your findings: Create your own document similar to "10 Usability Heuristics" in which you describe each heuristic in your own words and provide an example of a good design solution and a potential usability problem related to each heuristic (with descriptions and illustrations).