HCI Lecture 7

Mario Verdicchio Università degli Studi di Bergamo Anno Accademico 2024-2025



Image from: www.hotjar.com/blog/website-usability-testing/

Usability testing

- **Usability testing** is a set of research methods used to evaluate a prototype or an experience.
- It assesses the ability or inability of a user to complete a specific task.
- The goal is to identify the parts of our product that can be improved.

Usability according to Jakob Nielsen

- Learnability: how easily a user can perform basic tasks the first time they interact with the product; how easily the product can be learned.
- Efficiency: the speed with which a user can complete a task once they have learned it.
- **Memorability:** the time it takes for a user to regain familiarity with a product after having learned it and then not used it for a while.
- Errors: the number of errors users make, their severity, and the time it takes to recover from them.
- Satisfaction: the user's satisfaction when using the product.

Which characteristics are the most difficult to measure?

- Learnability: how easily a user can perform basic tasks the first time they interact with the product; how easily the product can be learned.
- Efficiency: the speed with which a user can complete a task once they have learned it.
- **Memorability:** the time it takes for a user to regain familiarity with a product after having learned it and then not used it for a while.
- Errors: the number of errors users make, their severity, and the time it takes to recover from them.
- Satisfaction: the user's satisfaction when using the product.

Which characteristics are the most difficult to measure?

- Learnability: how easily a user can perform basic tasks the first time they interact with the product; how easily the product can be learned.
- Efficiency: the speed with which a user can complete a task once they have learned it.
- **Memorability:** the time it takes for a user to regain familiarity with a product after having learned it and then not used it for a while.
- Errors: the number of errors users make, their severity, and the time it takes to recover from them.
- Satisfaction: the user's satisfaction when using the product.

Complexity in measurement

- **Memorability** requires more than one test, spaced out over time, to see how much the user remembers about the product's features.
- Satisfaction is an extremely subjective factor, making it difficult to measure and compare across different users (the key is to have them explain their reasons in as much detail as possible).

Types of usability tests

- **Moderated:** tests that involve the presence of a moderator, a person who facilitates the test using a script.
- **Unmoderated:** tests conducted through an online tool (e.g., usertesting.com) that collects data from users completing the test independently.

- **Specific goals:** it's difficult to test all of a product's features in a single testing session, so it's important to establish priorities based on business goals and prior information (previous tests, identified issues, etc.).
- For example, for a new product, we might decide to test the main user flow that follows the first login (registration, primary features, etc.).
- For an existing product where a high drop-off rate has been observed at checkout, we can test the payment process to identify critical issues.

- **Direct task vs. scenario task:** once the functionality to be tested has been determined, a script can be created to follow during the test.
- A direct task involves asking the user to perform a specific task in the product (e.g., "create a new note," "edit an existing note").
- A scenario task involves embedding the task within a scenario (e.g., "you're about to go grocery shopping and want to create a note with your shopping list," "as you're leaving, you realize you forgot the milk and want to add it to the list").
- Be careful not to give any kind of hint: instructions like "create a new note by pressing '+" or "edit a note by clicking on the pencil icon" undermine the value of the test.

- **Prototype status:** before using the prototype for a test, developers must be aware of its current state.
- The prototype should be tested multiple times before being used in a usability test: developers need to ensure there are no issues, and if the prototype is only partially developed, this must be clearly communicated to participants during the test.

- **Participants:** just like for surveys and interviews in user research, participants in usability tests should be recruited from the groups that are the primary target for the product being tested.
- **Humanity:** treat participants with respect, be precise with timing, create a welcoming atmosphere to make them feel comfortable, offer drinks and snacks, reassure them that they are not the subject of the test, but rather the product they are about to try.

- Equipment: if the test takes place on multiple devices (smartphone, tablet, laptop), remember to bring all of them to the test after checking their proper functioning and battery levels; the same applies to audio and video recording tools if they are to be used.
- Release forms: print and have the appropriate release forms signed (for the processing of personal data, personal data of minors, audio and video recording, etc.) depending on the type of test being conducted.

 The classic structure of a usability test script includes the following elements: **1. Introduction:** introduce yourself and explain to the participant how the test will be conducted, how long it will last, etc. This is the moment to remind them that it is the product being tested, not the participant, and to have them sign all the necessary release forms.

2. Demographic information gathering: basic information is asked (e.g., age, occupation). In reality, if the test participant is part of a previously defined target group, we should already have this information. There are testing methodologies where we don't have prior information (e.g., "guerrilla testing," where users are approached on the street), and in these cases, gathering this data becomes necessary. The format of the questions helps to be more tactful (e.g., "what is your age range?" is better than "how old are you?"; "what is your income range? From 25,000 to 35,000 euros per year?" is better than "how much do you earn per month?").

3. Background information gathering: depending on the type of product we are testing, it is useful to gather information about the participant's relationship with the relevant technology and their skills. For example, if the prototype is a new alternative to Snapchat, it is useful to know the participants' social media habits with questions like "How many hours per day do you use social media?" "In what circumstances do you use them?" "Do you have a favorite one?" etc.

4. Starting with open-ended questions: after finishing the section on the participant's data, we move on to asking questions about the product to be tested. At this stage, we don't ask them to perform a specific task, but instead ask broader questions such as "What impression does this product give you?" "Think aloud and tell me what the most obvious elements are and which ones you would interact with first." "What do you think is the purpose of this product?"

5. Task execution: this is the central phase of the test, where the participant is asked to perform the tasks for which the test was organized. It is very important to remind them to always think aloud, so we can understand the flow of their thoughts while using the product. Equally important is to remain silent and not assist the participant in any way.

6. Follow-up: It is the final phase, where we can ask follow-up questions, such as about the participant's satisfaction, the enjoyment of the experience, or even have them complete a survey (e.g., "after-scenario questionnaires" are designed to measure the difficulty of a task as perceived by the test participant).

Usability test: when?

 When to conduct a usability test? There is no universal answer. Potentially, every phase of product development can be verified with a usability test. A rule that always applies: the earlier something is tested, the sooner its flaws are found, and the sooner they can be fixed. The critical point is to understand when a test is necessary.

Usability test: with how many users?

 What is the right number of participants to get reliable results? In an article that has now become very famous, industry expert Nielsen states that with 15 users, 100% of usability problems are found, while with 5 users, 85% are identified, representing an optimal compromise between cost and results. He even goes as far as to recommend, when there is a budget for 15 users, to conduct 3 tests with 5 users in 3 different phases of product development.

*https://www.nngroup.com/articles/why-you-only-need-to-test-with-5-users/



Usability testing with mobile devices

Same goals and principles

Switching from testing desktop products to testing mobile products does not involve significant changes:

- From the perspective of objectives:
 - Measuring the usability of the prototype
 - Identifying areas for improvement
- From the perspective of interaction with participants:
 - Preparing tasks for them to perform
 - Observing participants without offering suggestions
 - Asking questions at the end

Different logistics

However, mobile technology does involve differences in the logistics of the test.

The key questions are:

- Do we allow participants to use their own devices?
- Do participants use their device as they normally would, or do they need to sit at a table or use a stand?
- What do we observe? Just the screen? Both the screen and the fingers? The screen, fingers, and participants' faces?
- How do we record the participants' experience?

Recommendation

 A camera on the screen is better than screen mirroring and recording: Observing only a duplicate of the screen makes it difficult for the observer, because without seeing the moving fingers, it's unclear when taps occur until their effects are visible. This leads to a slowdown and a decrease in the understanding of what's happening by the person conducting the test.

Where is the user about to tap?



Where is the user about to tap?



Recommendation

- The camera should be connected or pointed at the device so that the participant can use it naturally: the more natural the use, the more realistic and meaningful the test results will be.
- A very simple way to manage the recording is to point a camera from above or the side and have the participant use the device on a fixed spot on the table.
- This setup has at least two problems:
 - The use is not the natural and most common one.
 - It's hard to see clearly what's happening on the screen.

How to fix this?

Recommendation

Do not use cameras on the participant: recording their face during the test has few advantages and many disadvantages.

Advantages:

- We gain additional information about their reactions, emotions, and mood.
 Disadvantages:
- We might need an additional camera.
- We may have to synchronize two different videos (one showing the fingers on the screen and one showing the face).
- In reality, reactions, emotions, and mood can also be understood from the participant's voice in the video of their fingers, considering that they should be thinking aloud during the test.

To make do creatively

• Krug (2014) proposes a combination:

Gooseneck, Clip

Mount





A perfect solution doesn't exist...





Final recommendations

- As demonstrated by the case of the fullscreen smartphone, new form factors and technologies are continuously introduced, sometimes radically changing the ways of interacting with prototypes.
- It is the UX designer's duty to ensure that the usability of the prototype is not lost in the confusion caused by new shapes, technologies, and interactions.
- The best way to achieve this goal is through usability testing.
- However, it must be kept in mind that the same factors that influence usability require new and appropriate types of tests.

Usability test: with how many users?

 What is the right number of participants to get reliable results? In an article that has now become very famous, industry expert Nielsen states that with 15 users, 100% of usability problems are found, while with 5 users, 85% are identified, representing an optimal compromise between cost and results. He even goes as far as to recommend, when there is a budget for 15 users, to conduct 3 tests with 5 users in 3 different phases of product development.

*https://www.nngroup.com/articles/why-you-only-need-to-test-with-5-users/

Heuristics

• **Definition**: a practical method or rule of thumb used to solve problems or make decisions.

Dictionary

Definitions from Oxford Languages · Learn more



noun

plural noun: heuristics

a heuristic process or method.

Use over time for: heuristics

• the study and use of heuristic techniques. noun: heuristics

Origin

GREEK	MODERN LATIN	
heuriskein —	heuristicus	
find		late 18th century

late 18th century: from modern Latin heuristicus, formed irregularly from Greek heuriskein 'find'.



Characteristics of heuristics

- Efficient: quickly generates solutions with minimal effort
- **Automatic**: often applied unconsciously and intuitively
- Fallible: provides approximate answers that are not guaranteed to be optimal

Heuristics in UX

 Heuristics are widely used to evaluate the usability of user interfaces according to *recognized* principles.

Jakob Nielsen's heuristics

- About Nielsen: Danish, born in 1957, he studied Human-Computer Interaction (HCI) at the Technical University of Denmark in Copenhagen. He is considered one of the world's leading UX experts.
- Based on his professional experience, Nielsen developed 10 heuristics of interaction design: general principles that should help us reduce errors in our design.
- Heuristic: a rule derived from experience that does not have full theoretical support but works most of the time in professional practice.

1. Visibility of system status

- This heuristic refers to the importance of keeping users informed about what is going on, through appropriate and timely feedback.
- A system should always let users know what's happening, whether it's loading, saving, processing, or anything else, so they feel in control and aren't left guessing.

1. Visibility of system status



From "Manuale di sopravvivenza per UX Designer" by Matteo di Pascale

2. Match between system and the real world

 Always use icons, images, and language that are familiar to the user and easy to understand (e.g., a shopping cart-shaped icon to click on to access items purchased so far).



3. User control and freedom

- Avoid forcing the user who has made a mistake to close the app or website and start over.
- The user should always be able to stay in control and have the freedom to exit an unwanted state.

4. Coherence and standards

 Adopt the same convention and maintain it across all pages of the site: the user should never be in a situation where they wonder whether different words, buttons, or icons mean the same thing.



From "Manuale di sopravvivenza per UX Designer" by Matteo di Pascale

5. Error prevention

 Always try to incorporate mechanisms to prevent errors (e.g., search autocomplete on Google).





6. Recognition over recall

 It's easier for users to identify familiar items or options than to retrieve information from memory, so designs should prioritize making things easily recognizable rather than requiring users to recall them.



7. Flexibility and efficiency of use

- A complex product (e.g., a drawing tool like Adobe Illustrator) should offer flexible usage options and be satisfying for both inexperienced and advanced users: the same task should be executable in multiple ways (e.g., via dropdown menu or keyboard shortcut).
- Be careful not to confuse this heuristic with the recommendation to minimize interaction modes (e.g., it's better not to have several different login methods on one screen): here we're talking about different types of interaction (e.g., screen-based vs. keyboard-based).

8. Aesthetic and minimalist design

 "Less is more": every unnecessary piece of information takes attention away from what's truly important, reducing the visibility of essential content. Always aim to be concise and focused.



9. Help users recognize and recover from errors

- Avoid obscure error codes and always clearly explain what the problem is to help the user correct it and get back on track with their task.
- Note: some UX experts encourage explicitly indicating errors in the username or password when logging-in, but this practice is discouraged by online security experts (to minimize the information given to potential malicious users).

10. Help and documentation

- Systems are increasingly designed to be intuitive and usable right from the start. However, it is still good practice to provide support documentation that is:
 - Easy to consult
 - Focused on the tasks users need to perform
 - Supplied with step-by-step instructions to follow.