Human-Computer Interaction 2024/2025

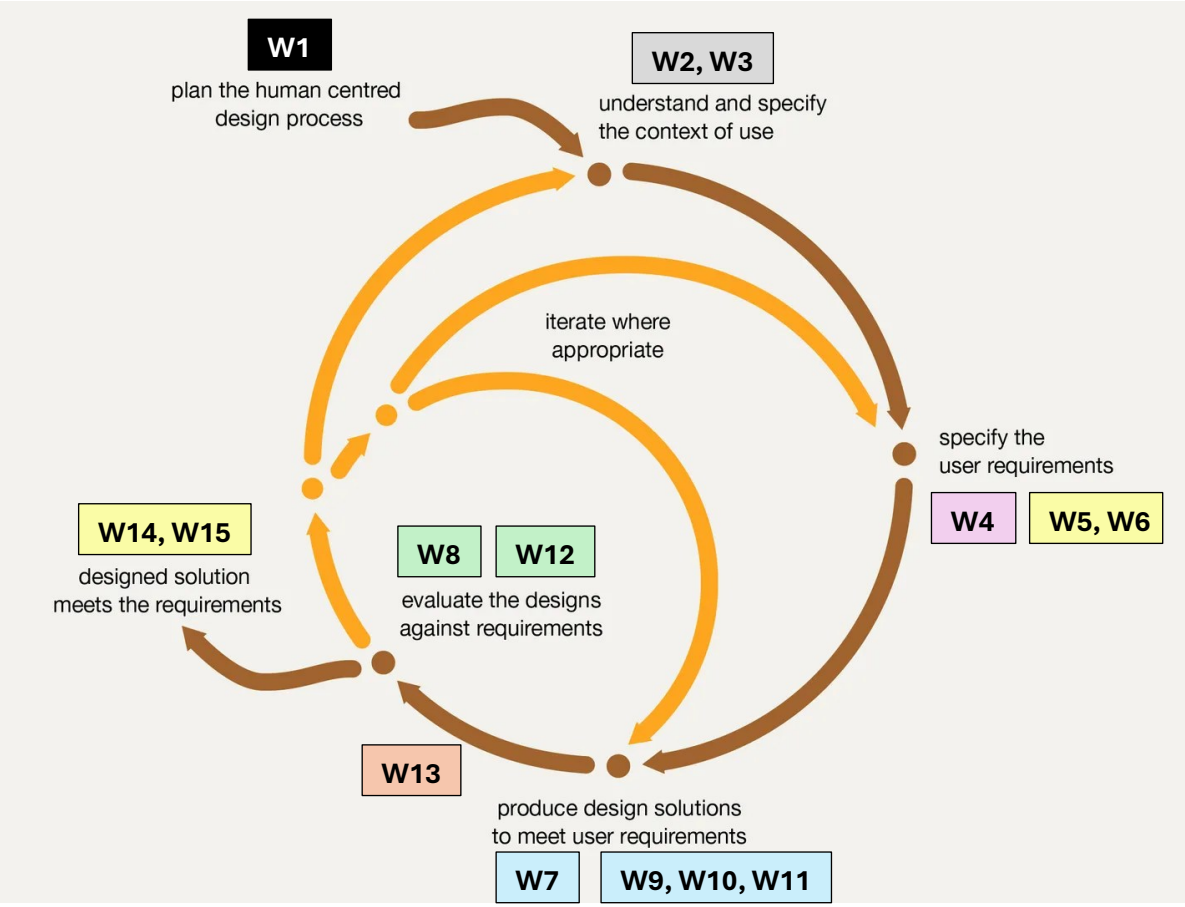
Lab Class 11

Designing and Applying Usability Tests

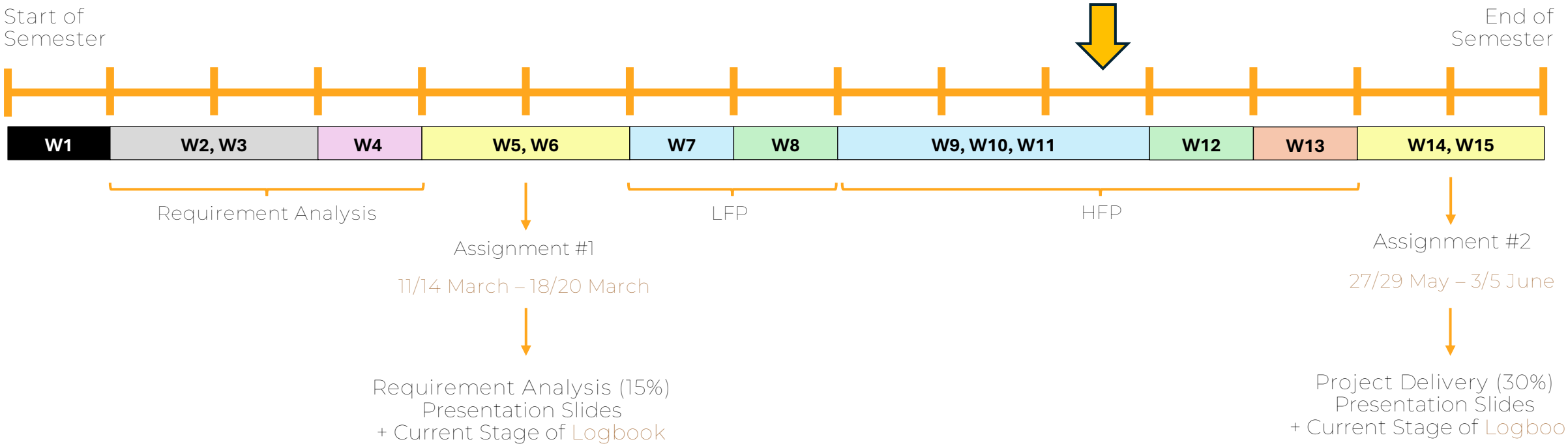
universidade de aveiro
deti departamento de electrónica, telecomunicações e informática

You are here!

This week, we finalize the development of the high-fidelity prototype (HFP) and prepare the usability test of next week



Assignments – Summary Timeline



Analytical Methods

Applied by experts

Do not require the involvement of users

- Heuristic Evaluation
- Cognitive Walkthrough
- Model-based Methods
- Review Methods

Limitations of Analytical Methods

- Subjective
- Involve several usability experts
- Cannot find all usability problems

Thus, we need additional tools for evaluating interactive systems

Empirical Methods

Involve users

Can include:

- Observation
- Query
- Controlled Experiments
- ...

Ethics in Applying Empirical Methods

- Asking for explicit consent
- Confidentiality
- Safety (avoid any risk)
- Freedom (users may give up at any time)
- Limit stress

It is the system that is being evaluated, not the user

Observation

many variants

- Direct: observer takes notes
- Indirect: through audio/ video - more complex and time consuming
- Think Aloud: users are asked to explain what they are doing
- Logging: users' activity is logged by the system
- Combinations of the previous, etc.

Query

Two main variants:

- Questionnaire (reach more people; less flexible)
- Interview

Should be carefully prepared and tested

Collected data needs to be carefully analyzed

Controlled Experiments

The work horse of science …

Important issues to consider:

- Hypothesis
- Variables (input or independent; output or dependent)
- Secondary variables
- Experimental design (within groups; between groups)
- Participants (number, profile)
- Statistics

Usability Tests

What you will need to do regarding your project

Usability Tests

Involve observation and query

Main aspects

- Participants
- Tasks
- Test Facilities and Equipment / Experimental Design
- Usability Measures
- Data Analysis

Complex Logistics

Participants

When performing and reporting (!) an evaluation you should completely characterize who were your users

- Number of users
- Demographics (age, gender, …)
- Their profile relevant for the context of the system
  - E.g., experience with smartphones, similar systems
- Are they representative of the target users?
  - If not, why is their participation useful, anyway?

Tasks

Why these tasks were selected
(e.g. the most frequent tasks, the most troublesome tasks)

The source of these tasks
(e.g. observation of users using similar products)

Any task data given to the participants

Completion or performance criteria established for each task
(e.g. n. of clicks < N, time limit)

Experimental Design

Procedure: the logical design of the test

Participant general instructions and task instructions

The usability measures to be used:

- a) effectiveness (completeness rate, errors, assistance, …)
- b) efficiency (times)
- c) satisfaction

Text Facilities and Equipment

The setting and type of space in which the evaluation will be done

- (e.g. usability lab, cubicle office, meeting room, home office, home family room, manufacturing floor, etc.)

Any relevant features or circumstances that can affect the results

- (e.g. video and audio recording equipment, one-way mirrors, or automatic data collection equipment)

Participant's computing environment

- (e.g. computer configuration, including model, OS version, required libraries or settings, browser name and version; relevant plug-in, etc.)

Display and input devices characteristics

Any questionnaires to be used

Formative vs Summative Tests

- Formative evaluations - (early in design - LFP) - used in an iterative process to make improvements before production:
  - What aspects of your design work/not work and why.
  - Methods: Heuristic review, Cognitive Walkthrough, etc.
  - Audience: Small sample - 5 users is enough (allows to learn quickly).

- Summative evaluations – (HFP is complete) - used to evaluate a complete design or shipped product in comparison to others:
  - How usable your designs are compared to competitors/benchmark.
  - Methods: Grade Experience – Pre-defined scale - Satisfaction; Ease of use; etc.
  - Audience: Large, representative sample – (takes time to recruit/test).

https://www.nngroup.com/articles/formative-vs-summative-evaluations/
https://www.usertesting.com/blog/formative-vs-summative-usablity-testing

Usability Questionnaires

- System Usability Scale (SUS)
- Questionnaire for User Interface Satisfaction (QUIS)
- User Experience Questionnaire (UEQ)
- NASA Task Load Index (NASA-TLX)
- Others…
- These questionnaires should be completed following the use of the evaluated UI

System Usability Scale (SUS)

- “quick and dirty”, reliable tool for measuring the usability
- Includes 10 questions with five response options
  - Questions 1, 3, 5, 7, and 9 are positively-oriented
  - Questions 2, 4, 6, 8, and 10 are negatively-oriented questions
- It allows to evaluate a wide variety of products and services
- Industry standard, with references in over 1300 publications

Benefits of using SUS

- Is a very easy scale to administer to participants
- Can be used on small sample sizes with reliable results
- Is valid – it can differentiate between usable and unusable systems

https://www.interaction-design.org/literature/article/system-usability-scale

SUS Questions

- I think that I would like to use this system frequently.
- I found the system unnecessarily complex.
- I thought the system was easy to use.
- I think that I would need the support of a technical person to be able to use this system.
- I found the various functions in this system were well integrated.
- I thought there was too much inconsistency in this system.
- I would imagine that most people would learn to use this system very quickly.
- I found the system very cumbersome to use.
- I felt very confident using the system.
- I needed to learn a lot of things before I could get going with this system.

SUS Questions – Likert-Type Scale

1. I think that I would like to use this system frequently.

1. Strongly Disagree	2.	3.	4.	5. Strongly Agree
○	○	○	○	○

2. I found the system unnecessarily complex.

1. Strongly Disagree	2.	3.	4.	5. Strongly Agree
○	○	○	○	○

3. I thought the system was easy to use.

1. Strongly Disagree	2.	3.	4.	5. Strongly Agree
○	○	○	○	○

4. I think that I would need the support of a technical person to be able to use this system.

1. Strongly Disagree	2.	3.	4.	5. Strongly Agree
○	○	○	○	○

Scoring the SUS

- Convert SUS responses to numbers:
  - 1 for “Strongly Disagree”
  - 5 for “Strongly Agree”
- For odd-numbered questions, subtract 1 from the response;
- For even-numbered questions, subtract the response from 5;
- Add the scores from each question and multiply the total by 2.5;
- Present the numbers as a SUS score, not a percentage.

Score from 0 … 100; SUS > 68 is considered good usability

https://www.nngroup.com/videos/system-usability-scale/
https://uxls.org/methods/system-usability-scale/

Scoring the SUS

- Follow the link to find an example under: “Scoring example”
  https://blog.uxtweak.com/system-usability-scale/

To better understand how to calculate an SUS score, we prepared an example.

Let’s imagine that a participant completed the SUS questionnaire following a usability test. Their responses are below:

Question Number	Participant Responses (Ranked One to Five)
1	5

Anatomy of a Usability Test

Basic steps to follow

Performing the Usability Test

Receive participant, explain the experiment and obtain informed consent

41549 – Human-Computer Interaction

Consent Form for Usability Test

INTRODUCTION

You are invited to participate in a usability testing session for [brief description for your application/system]. Before you decide to participate, it is important that you understand why the research is being conducted and what it will involve. Please take time to read the following information carefully.

PURPOSE OF THE STUDY

The purpose of this study is to evaluate the usability of [describe the interface/system being tested] and to identify potential areas for improvement. This research is being conducted as part of a class project for the Human Computer Interaction course.

PROCEDURES

If you agree to participate in this study, you will be asked to:

- Complete a brief questionnaire about your background and experience
- Perform a set of specific tasks using [the system/application]
- Think aloud while completing these tasks
- Fill a brief post-task questionnaire regarding the use of the tested system
- Participate in a short post-test interview about your experience

The entire session will take approximately [insert time, e.g., 10-15 minutes] to complete. With your permission, we may record [specify what will be recorded: screen actions, voice, facial expressions, etc.] during the session.

RISKS AND BENEFITS

Risks: There are no foreseeable risks involved in participating in this study beyond those encountered in everyday use of computers/digital devices.

Benefits: While there is no direct benefit to you, your feedback will help improve the design and usability of the system and contribute to the educational objectives of this course.

COMPENSATION

[Specify any compensation, if applicable, or state: "No compensation will be provided for your participation in this study."]

CONFIDENTIALITY AND DATA PROTECTION

In compliance with the General Data Protection Regulation (GDPR), we would like to inform you of the following:

Data Controller: The faculty for the Human Computer Interaction course is the data controller for the personal data collected in this study.

Types of Data Collected:

- [List specific data types, e.g., demographic information, task performance metrics, audio recordings, screen recordings, etc.]

Performing the Usability Test

Explain the overall context of your application and provide the user with a list of tasks to perform

For each of the tasks the user should note task difficulty, after completing it

Usability test
Tasks for a simple example

Tasks:
Find information concerning products at the online store:
https://amazon.com

Task 1	Find the last edition of the book entitled "Interaction design beyond human-computer interaction" to buy. What is the exact price in US dollars? --- Very difficult 1 2 3 4 5 Very easy
Task 2	What is its ISBN-10? --- Very difficult 1 2 3 4 5 Very easy
Task 3	When will it arrive to Portugal? --- Very difficult 1 2 3 4 5 Very easy
Task 4	What is the shipment cost to Portugal? --- Very difficult 1 2 3 4 5 Very easy
Task 5	What is the number of pages of the last edition? --- Very difficult 1 2 3 4 5 Very easy

Are your tasks adequate?

They need to ask for specific action/content and have a very clear ending

Tasks should not guide the user: “Go to the calendar and…”

Performing the Usability Test

While using the system, encourage the user to think aloud about what they are doing

User Code : _____

Observer's Table

Tasks	Did the user complete the task?	Correctly? (Y7N) (correct answer)	Max Time Observed time (mm:ss)	Number of errors?	Was lost?	Asked for help	Observed Easiness/difficulty 1 – very difficult 5 – very easy
1	no _| yes _|	(77.99 USD)	2min		no _| slightly _| a lot _|	no _| yes _| which?	1 2 3 4 5
2	no | | yes | |	(111990109X)	2min		no _| slightly _| a lot _|	no _| yes _| which?	1 2 3 4 5
3	no | | yes | |	(May, 6)	2min		no _| slightly _| a lot _|	no _| yes _| which?	1 2 3 4 5
4	no | | yes | |	(17,82 USD)	2min		no _| slightly _| a lot _|	no _| yes _| which?	1 2 3 4 5
5	no | | yes | |	(720 pages)	2min		no _| slightly _| a lot _|	no _| yes _| which?	1 2 3 4 5

Observations_____

_____

_____

Observe and take note of how the user performs, any errors, if they asked for help and how difficult you consider the task was for the user

Performing the Usability Test

After completing the last task, provide the user with the post task questionnaire (SUS)

Post Task Questionnaire

Instructions: Thank you for your cooperation with this study, which aims to evaluate the User Interface of the application/system and, try to improve it following the Usability criteria.
Your collaboration is important for the success of this evaluation, so we ask you to complete this questionnaire, the data of which will be used in total anonymity for scientific purposes only.

1. Demographic data

User number:_____
(check the correct options)

Gender: ☐ Female ☐ Male **Age:**_____ **Profession:**_____

Previous experience with this type of application/system: ☐ None ☐ Some ☐ A lot

Observations (fill in any relevant facts for this test, e.g. vision, handiness):

2. Overall opinion on the application/system (SUS)

After using the application/system and taking into account your final assessment, check the circle that best reflects your opinion regarding its usage. If you believe that these quantifications are not applicable, choose NA.

I think that I would like to use this system frequently.	Totally agree	○○○○○ Totally disagree	NA
I found the system unnecessarily complex.	Totally agree	○○○○○ Totally disagree	NA
I thought the system was easy to use.	Totally agree	○○○○○ Totally disagree	NA
I think that I would need the support of a technical person to be able to use this system.	Totally agree	○○○○○ Totally disagree	NA
I found the various functions in this system were well integrated.	Totally agree	○○○○○ Totally disagree	NA
I thought there was too much inconsistency in this system.	Totally agree	○○○○○ Totally disagree	NA
I would imagine that most people would learn to use this system very quickly.	Totally agree	○○○○○ Totally disagree	NA
I found the system very cumbersome to use.	Totally agree	○○○○○ Totally disagree	NA
I felt very confident using the system.	Totally agree	○○○○○ Totally disagree	NA
I needed to learn a lot of things before I could get going with this system.	Totally agree	○○○○○ Totally disagree	NA

Please leave any comments about the user experience provided by the application/system:

_____
_____
_____
_____

Thank you very much for your collaboration!

Document Templates

Templates for all documents are available at

UsabilityTest_Documents_Templates

You just need to adapt them to your case!

To do list

https://www.istockphoto.com/pt/fotos/metal-cutting

Tasks for today's class

Continue development of the High-Fidelity Prototype

Gather all the template documents for the user test

Tasks to complete until next class...

Finish the High-fidelity Prototype

Review the tasks used for the LFP and refine them as needed (you can change them, too)

Prepare all the documentation for the evaluation. You can have online forms if you like

Template for final presentation

You can already find a first template with some hints on the content expected for the final presentation in Teams:

2024_2025_Assignment_2_FinalProjectPresentation.pdf