LUT University
School of Engineering Science
Software Engineering Degree Program

Redesign of Moodle exam

Simojussi Suonpää simojussi.suonpaa@student.lut.fi
Erdal Muhamedi erdal.muhamedi@student.lut.fi
Ville Ormo ville.ormo@student.lut.fi
Eemil Riihimäki eemil.riihimaki@student.lut.fi
Sepideh Soleimani sepideh.soleimani@student.lut.fi

TABLE OF CONTENTS

METADATA

This report was based on the weekly assignments that were done together as a group. Each person used estimated 1-2 hours per assignment. To gather the information to this report Ville gathered the information for the section “1. Plan” and “3.4 Protorype 2: Digital prototype”. Erdal gathered information for chapter “2. Understanding”. Simojussi gathered information for sections 3.1 – 3.3. Eemil and Sepide created the native prototype and wrote the section “4. Produce” based on that.

1 PLAN

1.1 Problem definition

Our project focused on improving the user interface and experience of online exams at LUT, specifically those administered through Moodle. As there has been a quick change during pandemic that the basic paper and pen exams have moved from physical into digital form. These online exams have several advantages like accessibility, flexibility and effiency. However this shift also comes with it’s downsides and some of the intuitive features of paper exams are lost during this transformation to digital versions.

The user interface and experience of online exam platforms can vary significantly, impacting students' navigation, comprehension, and overall satisfaction of the exam process. As said earlier paper exams may lack on features when compared to digital one but the intuitiveness and the user experience of paper exam is undeniably good. It’s simple and questions are on linear format which allows user to progress through the test sequentially. This also translates to easy navigation of paper exam and usually it is also easy to have overall look of the exam questions and the overall form of exam to create a time estimate and follow your own progress.

As we gathered these positives of paper exams we also took a look of the negatives of digital exams in moodle and how to apply better UX and UI to these negative aspects. Moodle exams are usually formed from “pages” which each include their own question. This leads to harder navigation and it’s hard to visualize overall time estimate needed for each question

as you do not certainly know what to expect from each question. Our group tried to improve these UI issues regarding navigation, flexibility and lack of physical feedback to gain better UX for the moodle exams.

1.2 Benchmarking

As a part of planning and ideation we conducted a benchmarking for online examination softwares. The online examination software is a web-based platform used by educational institutes to conduct computer-based exams. All students need is a good internet connection and access to devices for taking objective and subjective assessments and tests.

Usually the web examination platform consists of exam creation, registration/ identification to platform, taking the exam on exam view, and grading of the exam plus publishing results. The objective of benchmarking is the Moodle “exam view” or the exam possibilities within the Moodle LMS. This benchmarking is not about which LMS is the best one. Our aim is to focus on the student dashboard and it’s UI and UX. The student dashboard consists of scheduled exams, ongoing exams, and completed exams. Completed and scheduled exams are just viewed by students. The active exams usually consist of: reading instruction before entering exam mode, starting the exam, viewing exam, answering question, viewing summary and ending/ returning exam.

Unfortunately, for benchmarking it was hard or almost impossible to find views of Moodle competitors' exams. But there was case studies and descriptions of competitive products. The information was found on companies which create the products and aim to provide these LMS’s to institutes to help them with the eLearning. Here is some description of competitive products:

Blackboard Learn:

Exam settings in Blackboard Learn allow instructors to configure various parameters, such as time limits, attempt restrictions, randomization of questions, and feedback mechanisms. Students begin exams by entering the Assessment Management Area, where they select the desired assessment and start the timer upon launching the exam.

Canvas by Instructure:

Canvas Quizzes offer a variety of question types, including essay, multiple choice, true/false, fill-in-the-blank, and short answer. Instructors can choose to display questions randomly, shuffle answers, and apply time limits. During an exam, students see a countdown clock and progress bar indicating completion percentage.

Brightspace by D2L:

Brightspace Tests & Quizzes offer a rich set of question types, including multimedia content, calculations, and branching logic. Instructors can configure settings such as time limits, attempts allowed, and randomization of questions. When taking a test, students see a countdown clock and progress bar, along with detailed instructions and navigation controls.

Here are few example views of online exams provided by online exam creation case study. Compared to Moodle there is a starting view which has the exam fully explained and student needs to ad tap that the has read and understood the assignment:

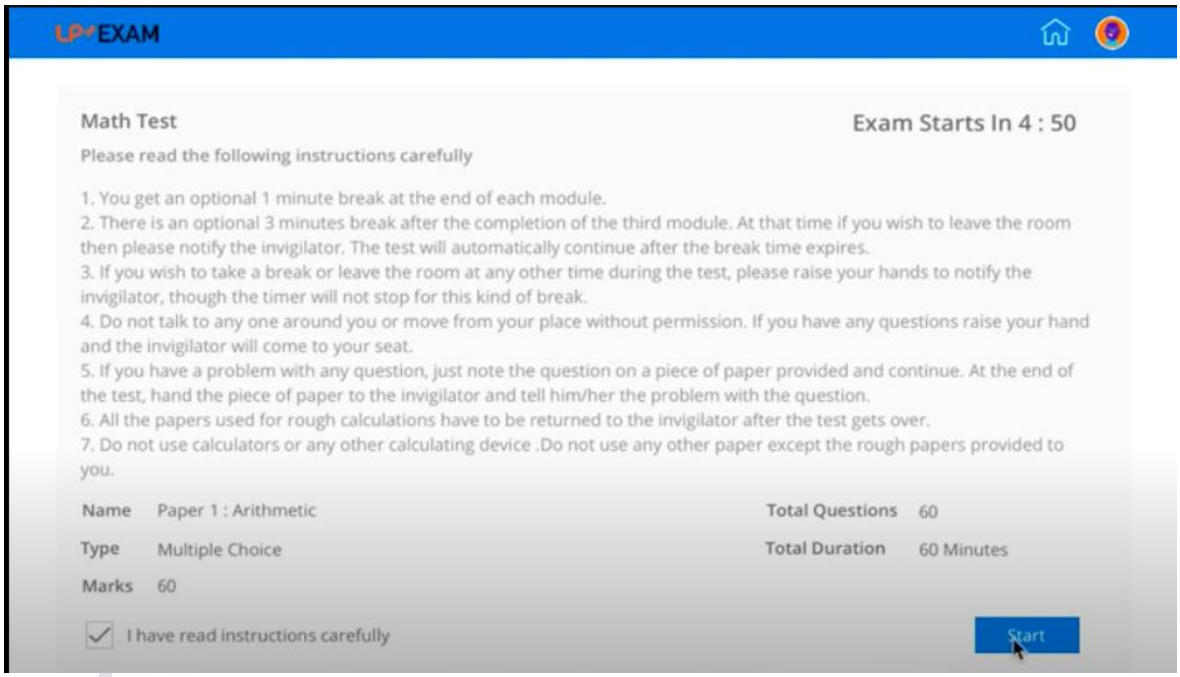


Figure 1. Dashboard view before starting the actual exam

Moodle's exam overview could also be improved like on the example beneath. Students can mark some questions even though they answer to them “mark for review”. This way they can easily come back to questions they were unsure of before the return of the exam.

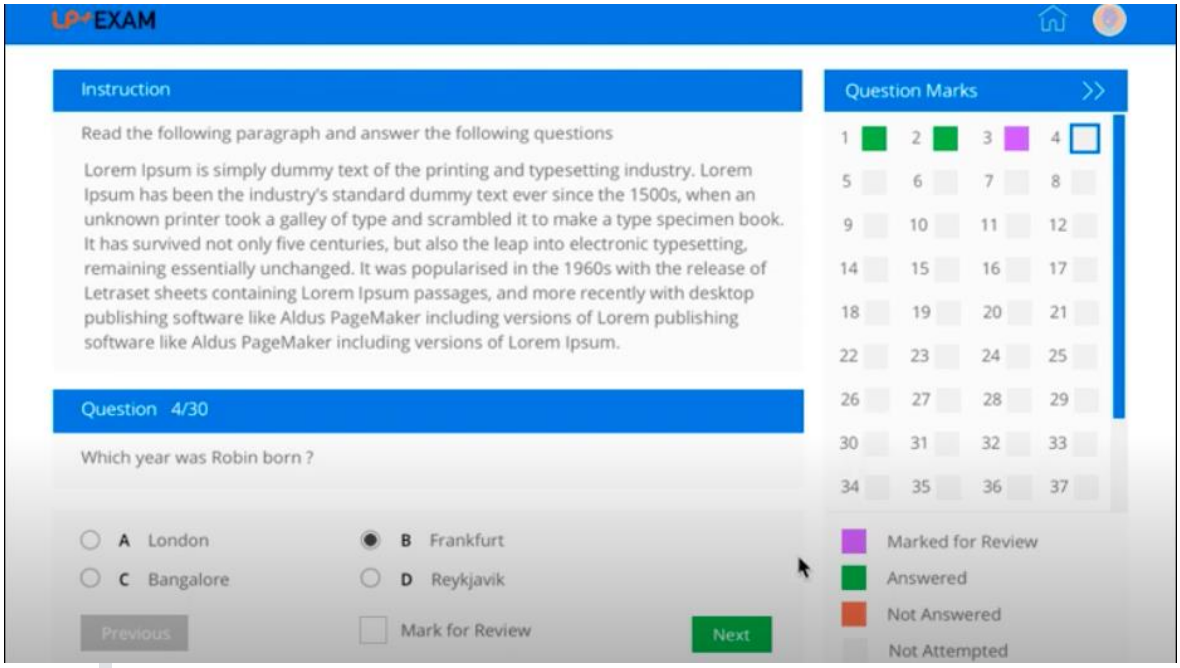


Figure 2. Dashboard view of the exam overall and "mark as review" feature.

Some of the crucial factors/ features found and proposed for online examination UI: Font, Background colour, Sound alert, Questions group, Time counter, Number of questions per page, Questions formats, Feedback and Security.

1.3 User research

For the interviews we gathered insights from LUT students in User Interface course. The information that we were looking for ways to find out about current system’s strengths, weaknesses, and areas for improvement. The interview guide was designed collaboratively by qwerty group drawing on their collective experience with Moodle exams and using the PACT framework.

Main thing that we wanted to gather from the interview was to understand:
- **Peoples aspect:** Understanding the participants preferences regarding online exam

- **Activities aspect:** Identifying the strengths and weaknesses of the current Moodle exam system

- **Context aspect:** Comparance between traditional paper exams vs. Online Moodle exams

- **Technology aspect:** Prevention of cheating during online exams and technological issues encountered during Moodle exams

- **Suggestion aspect:** Gathering participants suggestions for better Moodle Exams.

Interview questions were structured to cover these aspects. Participants were also asked background questions to provide context, for example academic program. Their preferences for exam formats, strengths, and weaknesses of the current system were explored and it was also compared to traditional paper exams. Technological aspects such as proctoring technical issues and helpful features were addressed.

Overall, the interviews aim was to gather as much information as possible to make development ideas for the User Interface part of the exam as well as make it more reliable.

1.3.1 Research methods

We chose to do the interviews by first creating good questions for the interview. Interview method we used was individual interviews through Teams. We split the interview guide into five parts: people, activities, context, technologies, and end.

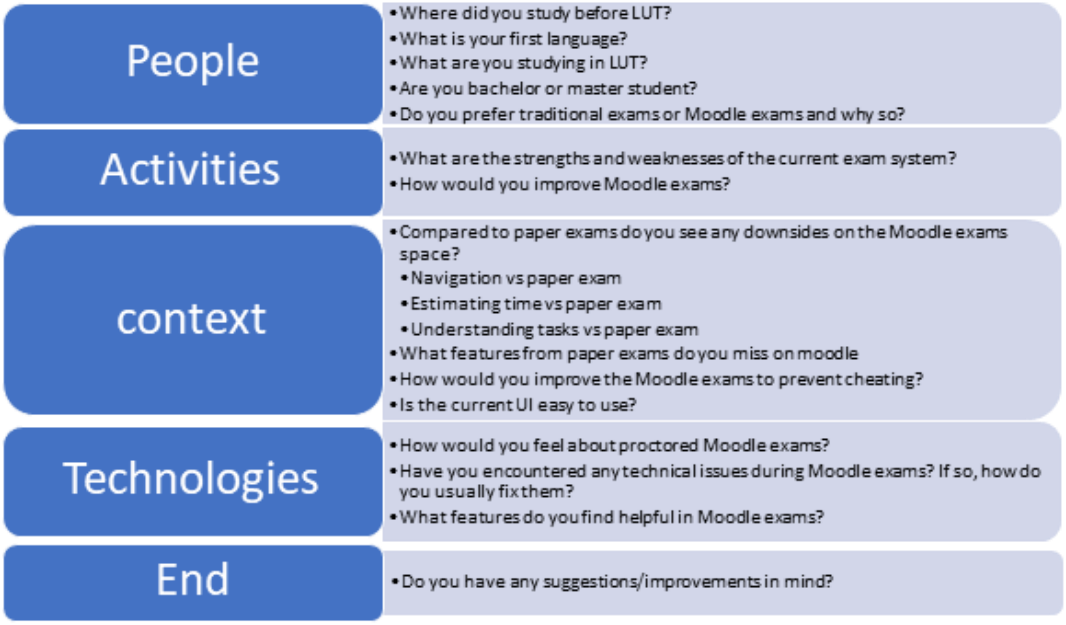


Figure 3. Sturture of interviews based on PACT framework.

We interviewed three students from this course. We chose the students by knowing them beforehand. After carefully selecting the questions for the interview guide, one of us interviewed the students one by one through Teams. The interviews were recorded, and we wrote down the results from the videos after the interviews.

1.3.2 Findings

From the interview our group received valuable information for the redesigning project of the Moodle exam. This information contained things that are good and works on the current version, things that require improvement and suggestions for new features that would make Moodle exams even better. A summary of the results is presented below in a form of an affinity map.

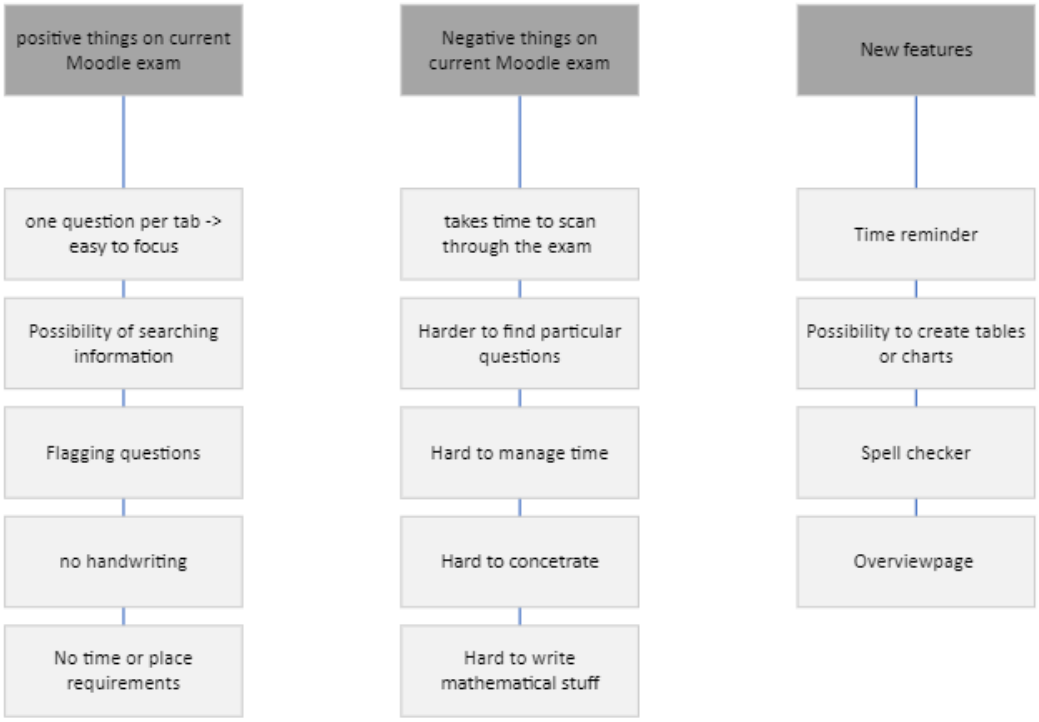


Figure 4. Summary of the interview results

Interviewees of university students using Moodle exams, all adults with prior study experience, though not necessarily with computer-based exams. The diverse user group faces language challenges, as Moodle is mainly in Finnish or English. Despite this, their shared goal is to perform well within the exam's constraints. Feedback highlighted a desire for features like creating tables and charts. Interviewees valued the flexibility of taking exams anywhere and objected to the idea of proctored exams, which they felt would compromise this freedom.

2 UNDERSTAND

The research was done by our group to three industrial management students. All the students were doing their bachelor's degree and were Finnish speaking students. All the students included on the research preferred Moodle exams as it was more relaxed and there were no time or place requirements to be done. One of the good sides of the Moodle exams

were that it was digitally done, so no need for papers, pens etc. However, students preferred paper exams for math exams as it was easier for them to answer questions by writing them.

Students said that the strengths of Moodle exam:

- Simpleness, easier to focus on one question per tab
- Possibility of searching information like in the company world nowadays

Weaknesses were:

- Temptation to cheat
- Time management
- No time alerts
- Temptation to focus on something else, specially at home: games etc.

Research findings had pretty much same theme throughout the interview for the improvements. Students wanted to have more clear navigation for example to look through the exam paper, more clear time management for example alerts and the prevention of cheating. To create more visualized thoughts of the students, we created based on the answers provided affinity map (table 1.) and empathy map (table 2.). All the answers for research interview can be also found on appendix 2.

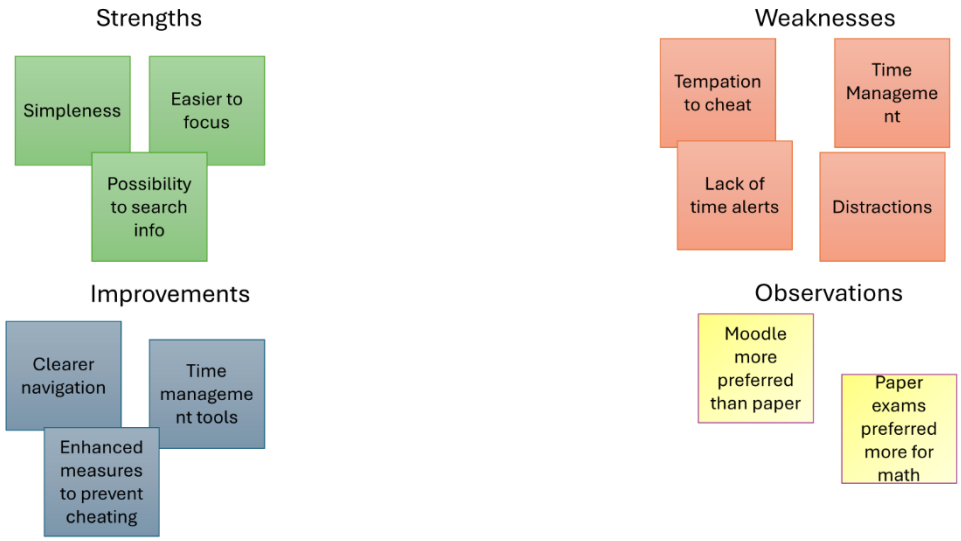


Figure 5: Affinity map

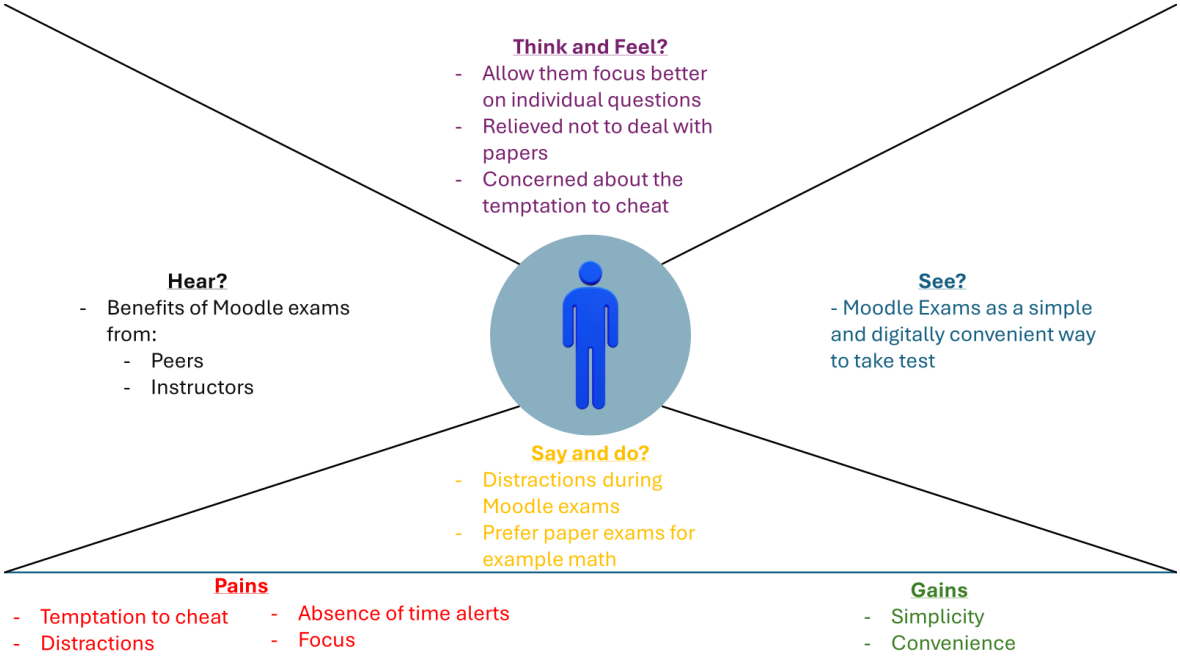


Figure 6: Emphaty map

3 DESIGN (ITERATIVE PROCESS)

In this section the redesigning of the Moodle exam will begin. The designs will be based on the interview outcomes and group members personal ideas on possible ways to improve the exam.

3.1 IDEATE

During the first steps of the ideating process of redesigning the Moodle exam our group performed a brainstorming session where ideas of how to improve the exam were introduced to each other. Since the interview outcomes showed that the user interface itself is working and does not require changes, the brainstorming was more focused on the usability of the exam system by adding new features and improving the layout. The brainstorming outcomes were visualised and documented as a concept map which can be found from the following picture.

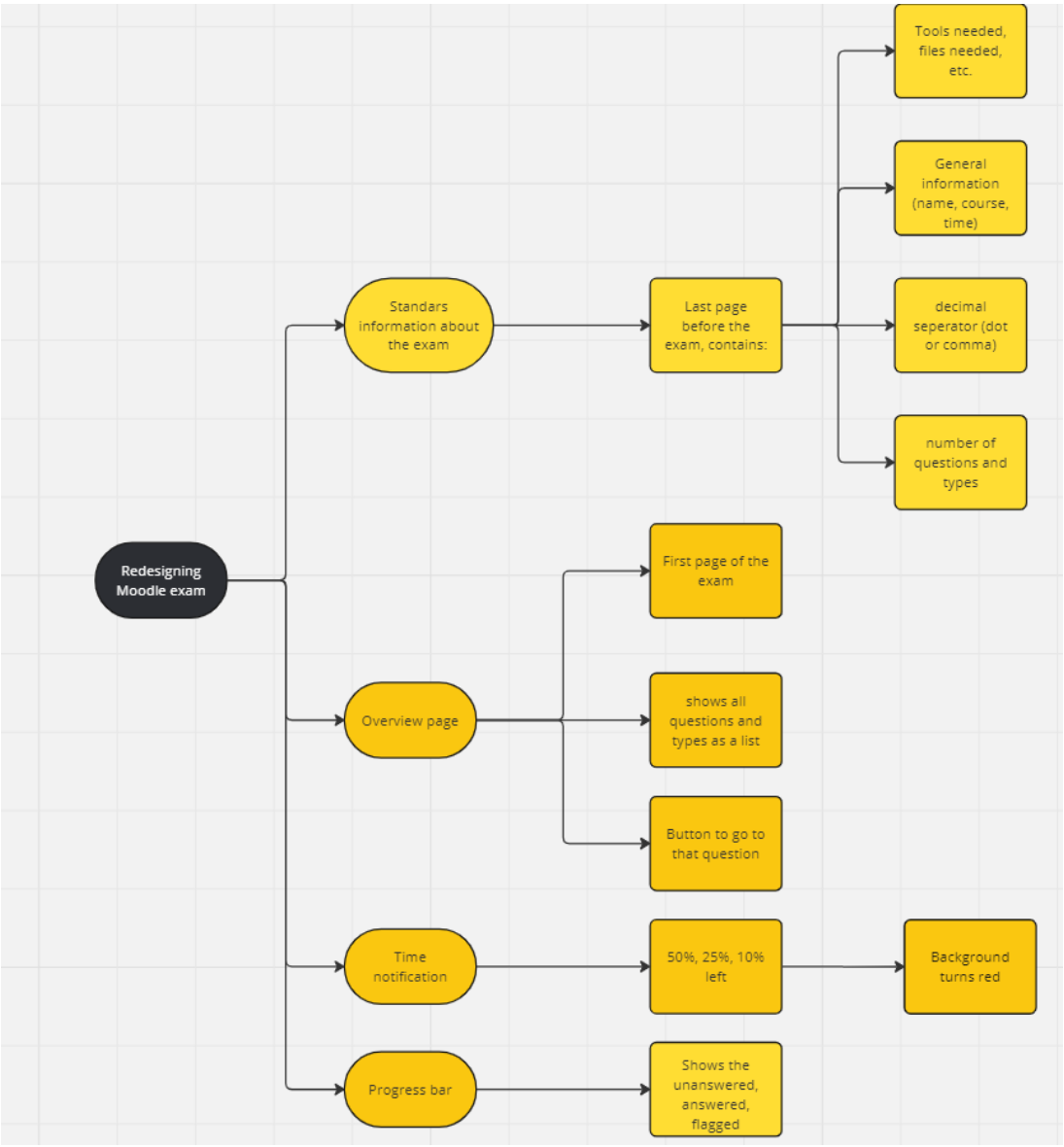


Photo 1: concept map of brainstorming session

The overview page idea comes from the need of quickly visualizing the exam questions and problems understanding the time needed to answer specific questions of the exam. This problem came up in the interviews as well as in the group members initial thoughts of a way to improve the exam. The overview page is the first page of the exam where all questions and the type of question is shown. In this view the user may flag some questions and assess the time needed to answer each question to help planning the execution. This view can also have the opportunity to answer to the question if the teacher allows it, but it also has buttons on each question to move into that question answer area. Being able to answer to just one question at a time came up as a positive feature of the current exam system.

3.2 PROTOTYPE 1: PAPER PROTOTYPE

Based on the ideas gathered through brainstorming by the group members, a paper prototype was made to roughly present the ideas to help with evaluation. Paper prototype can be found from the photos below.

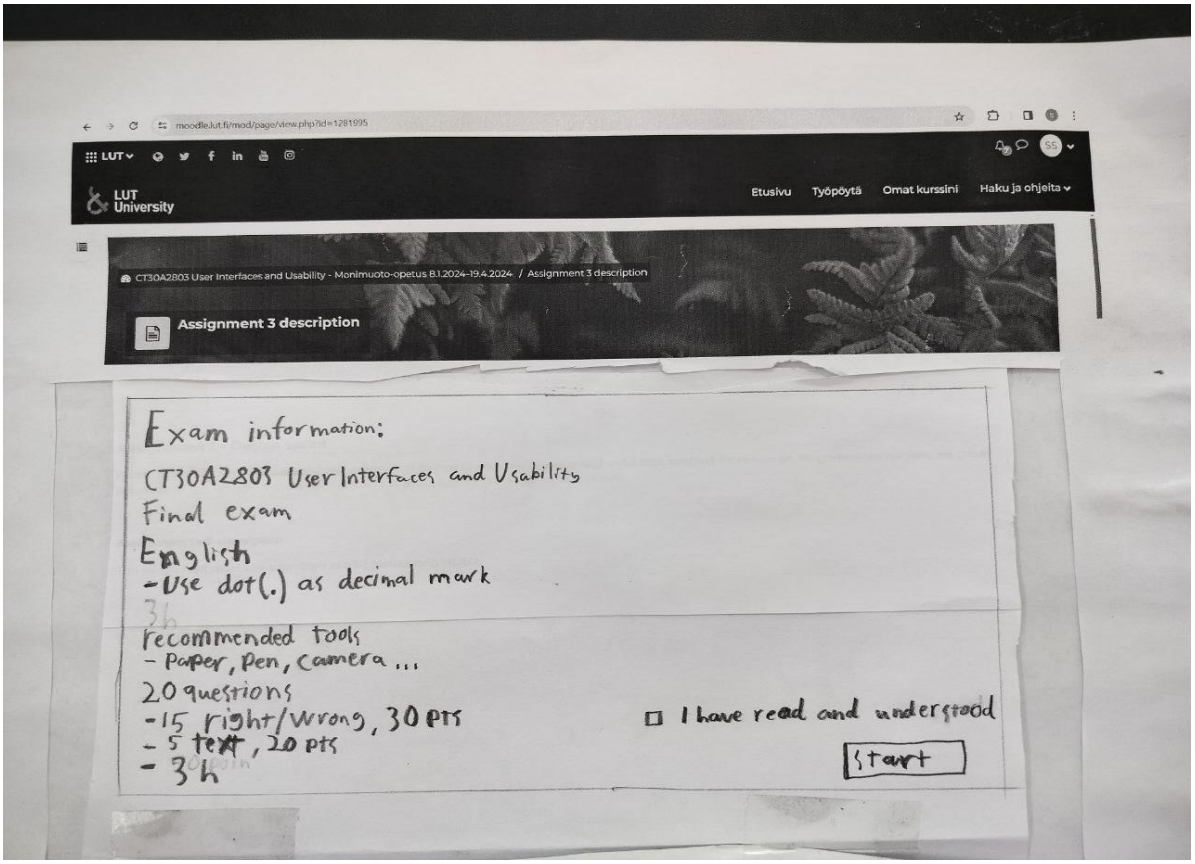


Photo 2: Paper prototype, general information

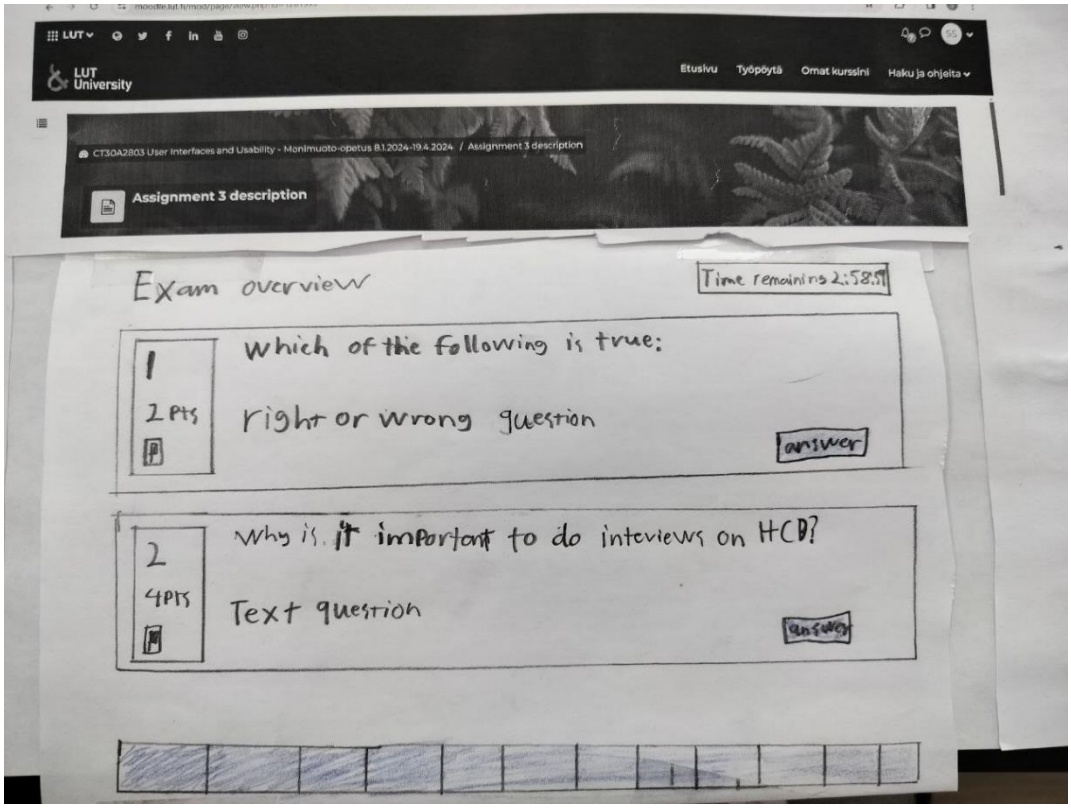


Photo 3: Paper prototype, overview page

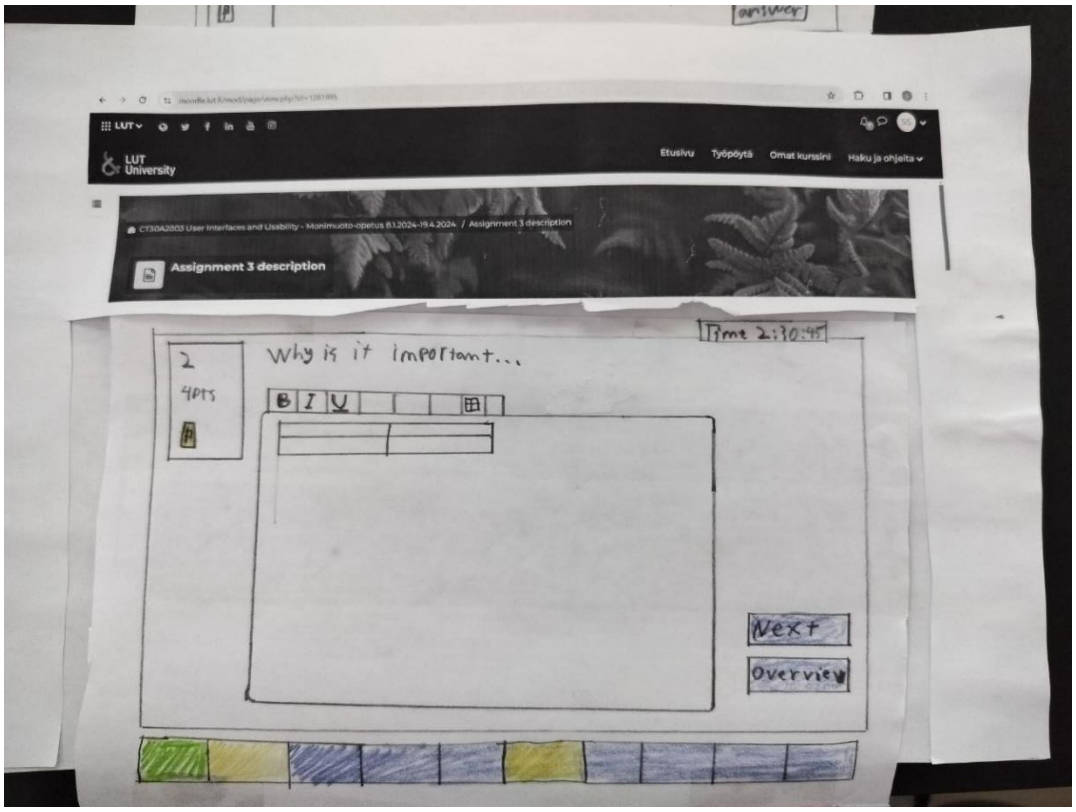


Photo 4: Paper prototype, text answer

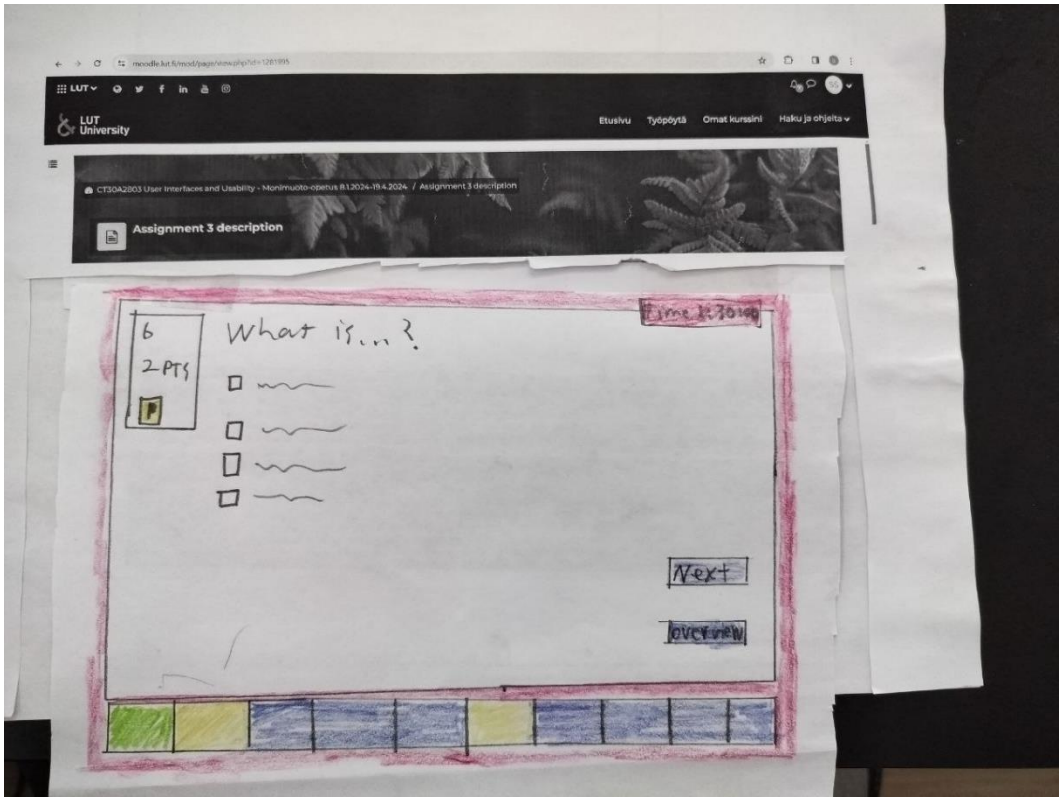


Photo 5: Paper prototype, time reminder

3.3 EVALUATE 1: PAPER PROTOYPE EVALUATION

The paper prototype was presented to another student group for testing and evaluation purposes. The evaluating group found two “flexibility and efficiency of use” problems and two “recognition rather than recall” problems.

First problem was that the general information part has a check box for confirmation of reading and understanding the information. The evaluating group did not like the extra click is caused and recommended that it would be replaced by a text implying that starting the exam means that the information has been read. This is a low severity problem that has a low to no effect on the usability of the design. Second efficiency related problem was that there was no previous button on questions which would mean that moving back to the previous questions would have needed to be through overview page. This is a medium severity problem that has a high impact on the usability but is easy to fix.

First recognition related problem was that all questions look the same. This could be fixed by assigning different colors to different questions and possibly having alternating background colors on questions next to each other. This is a low severity problem since it is easy to fix and has little to no effect on the usability. The complete heuristic evaluation summary can be found from the appendix 1.

3.4 PROTOTYPE 2: DIGITAL PROTOTYPE

As the paper prototype was evaluated on the heuristic evaluation, we started to create digital prototype with figma based on the paper prototype and ad the changes recommended by the heuristic evaluation results. Also

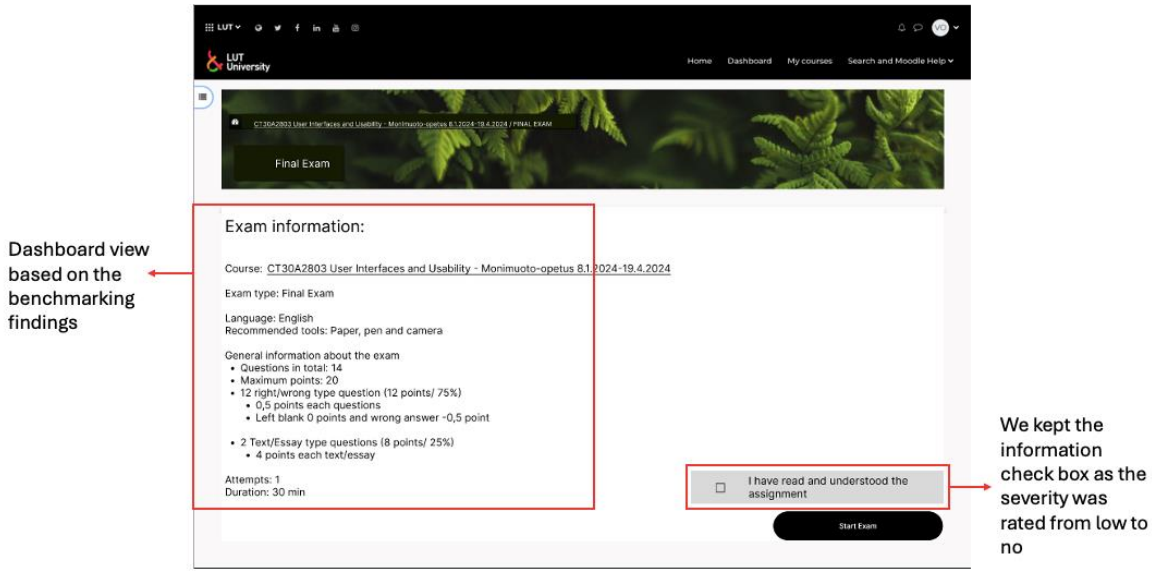


Photo 6: Digital Prototype starting page of moodle exam

Overview page as the front page of the exam that shows all of the questions and question types was something that was ideated on the meetings of our group at the start of the project. Some of the information were adapted from the benchmarking phase.

When we started to create the question page's on the digital prototype tried to incorporate several key material design principles. Mostly focused on clarity, responsive design and navigation.

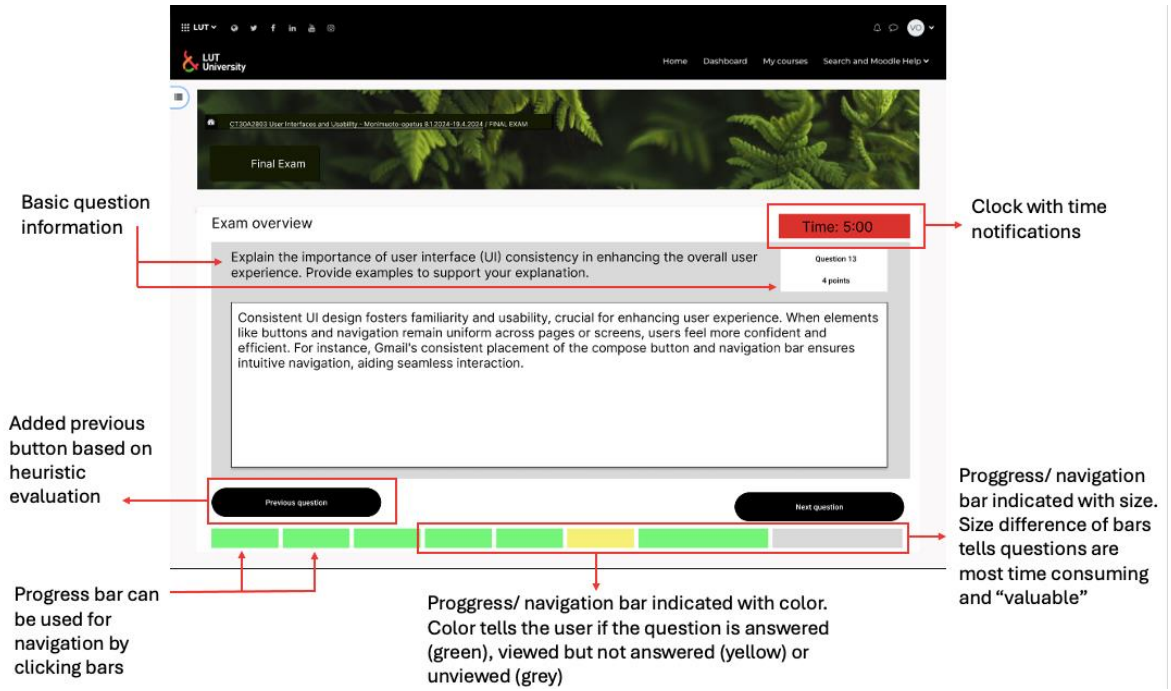


Photo 7: Digital Prototype question page of moodle exam

Depending on the question type, the interface adapts to provide the appropriate input method (text field or tabs for multiple-choice questions).

Top header was placed to provide context and clarity to the user about the current question they are working on. It's essential for guiding the user through the exam process. Also providing the question number and points gives users a clear understanding of the structure of the exam and the value of each question. This clarity can enhance user experience and navigation.

Timer for the time left on the exam is a useful feature to keep track of the remaining time, helping users manage their time effectively during the exam. This type of clear and readable typography is essential for time-related information.

Navigation buttons were placed at the bottom of each question. They are easily accessible and intuitive for users to move between questions for clear and accessible navigation.

The progress bar at the bottom, with individual bars for each question, offers a visual representation of the exam's progress. The color-coded bars (green for answered, yellow for viewed but not answered, grey for unviewed) provide feedback to users about their progress and which questions need attention. Use of color-coded progress bars and clear information presentation enhances user experience by providing visual cues and feedback. The size difference between bars indicating the time consumption and "value" of questions is an innovative approach to visualizing the exam's structure and can help users prioritize their efforts effectively.

Link to figma digital prototype:
https://www.figma.com/file/S7SweEsQko81IKzNbqZoTK/qwerty-Moodle-digital-mockup?type=design&node-id=11-1833&mode=design&t=tKY0nrQ7Or0l9kkx-0

Link to demo video of digital prototype:
screen-capture (1).mp4

4 PRODUCE

To the native prototype we applied the material design practises as explained in last section “3.4 PROTOTYPE 2: DIGITAL PROTOTYPE” . We build the native prototype using KivyMD.

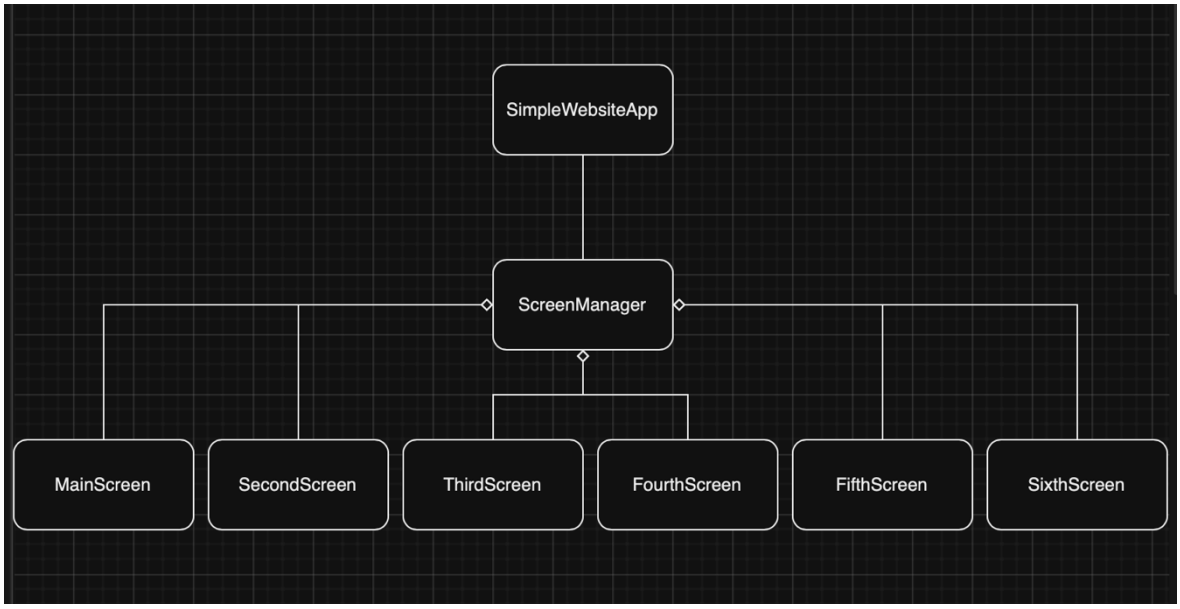


Figure 7: Sketch of the program structure

The whole program is SimpleWebsiteApp, which launches ScreenManager. Screen manager manages the screens and transitions between screens. Each screen is created as a subclass of the class “Screen”, from screenmanager. Each Screen has buttons which are used to answer the questions and move between Screens.

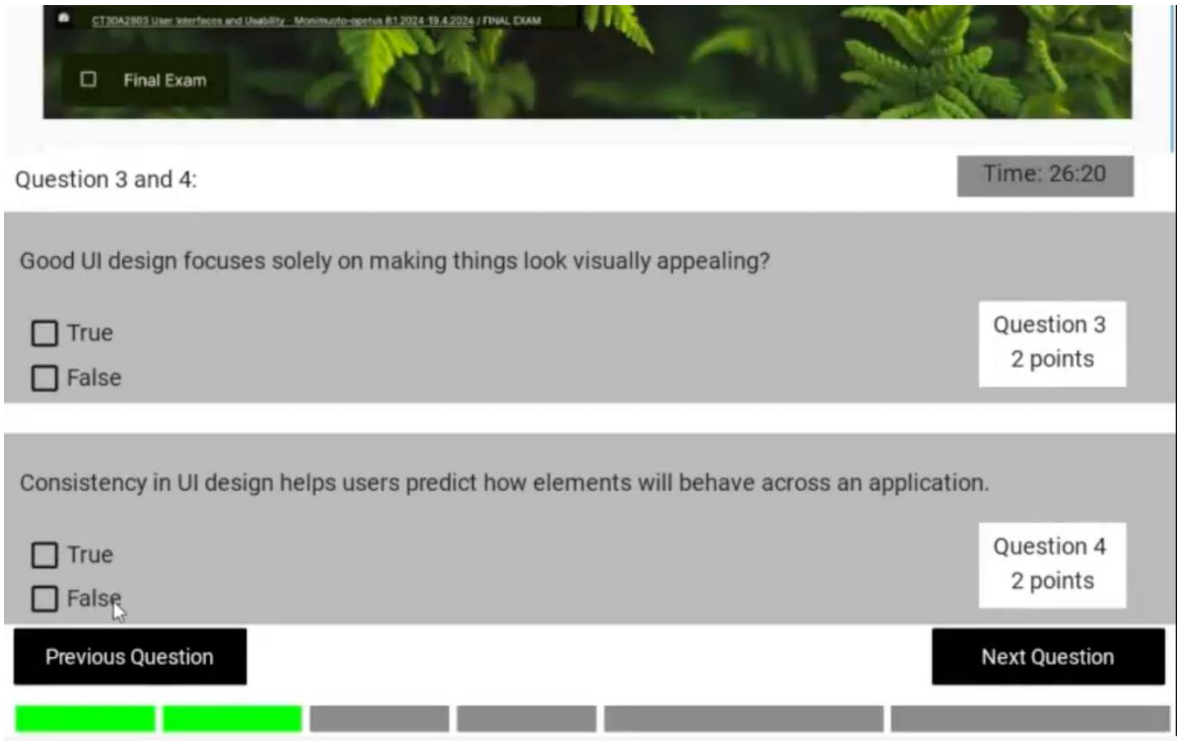


Photo 8: Screenshot of the application when running

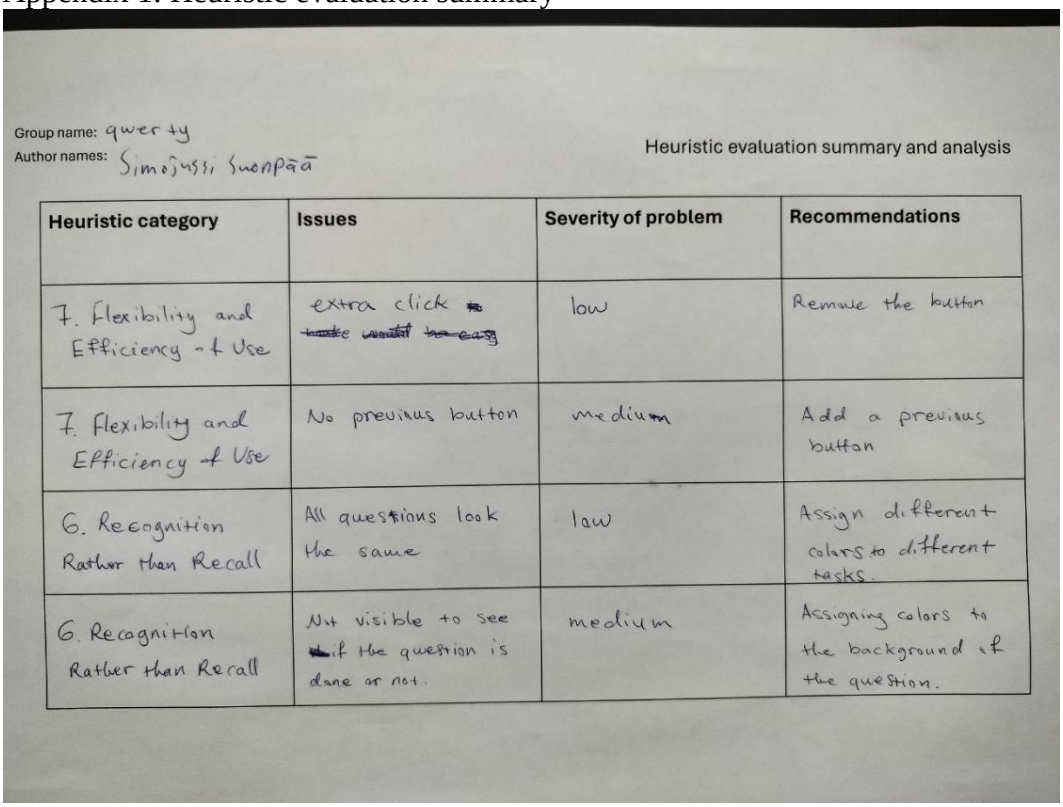
We were able to implement all the features from our prototypes. To create the native prototype, we used widgets such as buttons, labels, and checkboxes. The screen themselves were also created as a subclass from the screen widget. Buttons, checkboxes, and labels were used to build the questions and to interact between pages.

When the design would be fully responsive, you could use the navigation bar below to go from one question to the other. The bar would also indicate the status of the question, has it been fully answered, or only partially, or is it still to be opened. The clock on top right corner shows the time that is still left for the exam, and it turns red when the time starts to run out. The “nest question” and “Previous question” buttons can also be used to travel between questions.

Link to demo video of the native prototype:
FrontEnd Interface

APPENDIX

Appendix 1: Heuristic evaluation summary



Group name: qwerty
Author names: Simo Jussi Suonpää

Heuristic evaluation summary and analysis

Heuristic category	Issues	Severity of problem	Recommendations
7. Flexibility and Efficiency of Use	extra click ~~to make easy~~	low	Remove the button
7. Flexibility and Efficiency of Use	No previous button	medium	Add a previous button
6. Recognition Rather than Recall	All questions look the same	low	Assign different colors to different tasks.
6. Recognition Rather than Recall	Not visible to see if the question is done or not.	medium	Assigning colors to the background of the question.