Crafting the Backpack

How can we help HCI students choose elective courses efficiently and improve their satisfaction with the HCI Master's program?

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1. Introduction

The starting point of this project arrived in conjunction with the process of deciding on future elective courses. We noticed that not only did the Uppsala Human-Computer Interaction (HCI) students feel frustrated with this process; it was a widespread discussion. We soon realized there seemed to be a relevant need to research this issue.

In order to give students some freedom to shape their programs, many elective options are introduced in university degrees. Often, these electives have very vague descriptions, and students don't get to meet the lecturer or alumni who have taken this elective course before the application period ends. Additionally, there are many rules that apply when choosing elective courses - many of them are unclear and unknown.

Realizing that every Uppsala student was using the same system, we initially wanted to help all Uppsala students with our design. But after the completion of the first couple of course seminars, while researching to understand the used systems, we recognized that we had to narrow down our focus. Therefore this report only focuses on the research and issues targeted at the HCI program. By doing so, we could access more relevant people and would be able to acquire consistent knowledge about the problems our specific target audience experiences during the process of choosing electives.

The aim of our project was to examine if there were any potential improvements to the process of choosing course electives at the Uppsala HCI program. Selecting courses should be easy and efficient so that students should feel satisfied with the process and the program itself. In this report, we will explain our theoretical background, as well as argue for the methodological decisions taken while gathering data and how the data was analyzed. Furthermore, it will be explained how the analyzed data helped us to make informed decisions on how to create our design and how we evaluated the design itself. Finally, we will discuss the pros and cons of our project solution while giving ideas for future improvements.

2. Theory

2.1 Paradox of choice

Schwarts (2004) argues that the range of choices people face every day has increased in recent years, which has made it more difficult and demanding to make wise choices. This phenomenon is also present in higher education. He discusses that in the past, universities have had fixed curriculums, and now they offer a wide range of choices of courses, which becomes a cause for negative feelings such as regret, fear of missed opportunities, and raised expectations. The author compares choosing elective courses nowadays to a shopping experience. This is a metaphor that was made use of in the design phase of this project by mimicking an online shopping experience and the various features associated with it.

Moreover, the author's biggest concern about 'shopping for knowledge' is that students often do not have all the resources they need in order to make wise choices. With our final solution, we aim to solve the issue by providing all necessary information to students in one single platform or suggesting possible ways of obtaining this information.

Lastly, the author identifies two types of people based on how they make choices- maximizers and satisficers. Maximizers want to make the best choices possible and carefully examine all options while satisficers look for the options that are just good enough. This is highly relevant to our research as students can also be split into these two categories. This became apparent during the data gathering phase, and later on, we created two different personas of students- a maximizer and a satisficer. We made sure to address the needs of both personas in our design solution.

2.2 Evaluation of selection criteria

Several other articles about academic decision-making were studied to inform our research methodology design. Relevant survey and interview questions and popular course selection criteria were extracted. Questions from the following categories: Future Importance, Difficulty/Negativity, Decision Process Description, Certainty/Comfort, and Independence (Galotti, Tandler, & Wiener, 2014) were considered relevant for our study and were used directly or were paraphrased to fit the needs of our research. They helped us get valuable insights into the decision-making patterns of HCI students.

Moreover, we got informed about the most preferred course selection criteria from two papers that studied a wide range of initial criteria. Ting, D. H., & Lee, C. K. C. (2012) found that the most important variables that influence the students' selection of electives are the perceived difficulty of the course, perceived interest in the subject, and relevancy for the student's future career. Another paper's results indicate that the top three factors influencing the decisions are: course hours, the usefulness of the course in a real working environment, and connection with the lecturer (Koksalmis, 2019). All these criteria were considered relevant for our data gathering phase. We used them in our research by including them in the survey and interview questions. Furthermore, they were taken into account while designing the requirements for the final design solution.

3. Data Gathering & Analysis

3.1 Methodology

3.1.2. Survey

A survey was conducted to collect quantitative data on students' experience selecting elective courses. We have surveyed first-years, second-years, and alumni of the HCI program at Uppsala University. The results were used to validate data obtained in other research activities; these activities are discussed in subsequent sections of this paper.

To do the survey, we first created the questions and the survey via Google Forms. Once the survey was designed, we shared it in several HCI social media groups and reached out to some potential candidates individually (primarily second-year students and alumni). Each participant was first asked to read and sign a consent form. The form explained the purpose of the study, what the data is used for, and that they may withdraw at any given time and have their data removed per GDPR Article 17 law of erasure (Regulation 2016/679). The survey questions are listed in Appendix B.

3.1.2 Interviews

We conducted interviews with the program coordinator of the HCI program and a course administrator at Uppsala University to also understand their perspective on the topic. The goal was to find out why the current process exists, how the process works, and what are some common questions students ask during the course selection process.

The interviews were conducted either online or in person. An interviewer and observer were present during the interviews. All sessions were recorded to be used for transcribing and analysis in a later stage. Consent for participating in the interviews was obtained prior to every interview.

3.1.3 Focus Groups

To understand the students' perspective, we conducted two focus group interviews, each with five to seven participants, a facilitator, and an observer. The first focus group was conducted with first-year HCI master's students to learn about their experience of choosing electives for the first time at Uppsala University. We also conducted a focus group with experienced elective courses applicants (second-year students and alumni) to know about their experience with the process, selection strategy, criteria, and information gathering methods.

Conducting focus groups gave us a clear picture of what problems the students are facing with the current process, where they struggle, and what help they expect to receive during selecting electing courses. The session was recorded to be used for transcribing and analysis in a later stage. Like the interviews and surveys, each participant signed a consent form before the interviews.

3.1.4 Thematic analysis

Once the data-gathering phase was completed, we started analyzing the data obtained from the interviews with the university staff and the focus groups with students. We also included the answers to the open-ended questions from the survey in the data set. We chose inductive thematic analysis as our method for analyzing the qualitative data. We transcribed the recordings and tagged them with appropriate codes. These codes helped us discover different themes (trends or patterns) in the data. We distributed all the codes in the appropriate themes. We re-iterated the same process in order to refine the themes.

We used the application considerly (https://consider.ly) to perform thematic analysis. It also provided additional insights that helped us understand where the issues lie by showing us various comparisons and visualizations. The interviews and focus groups were analyzed separately as the context is different in each case. The subsequent section outlines the themes generated from analyzing the qualitative data of students and staff. Appendix A.3 shows the visualization of overlapping of tags used for coding, which helped us infer the relationship between themes.

3.2 Results

3.2.1. Statistical Analysis

The majority (42.9%) of students indicated that they tend to think about electives for at least a couple of days, and around 30% think about it a lot. This is two-thirds of all students.

Interestingly, students do not think that they are getting enough information (Appendix C.4). The majority of them evaluated two out five (one being the worst) the way they are informed. Along with this result, we saw that a great number of students are very likely to look for extra information when they choose electives. Combining these results, we found that if students do not feel informed, they tend to look for additional information. Therefore we can argue that there is a clear need for a tool that helps them to be informed properly. Appendix C.5 shows that most students tend to collect more information by talking to classmates and browsing the Uppsala University website.

The survey results also showed us that fee-paying students are more likely to worry about not making the best choices compared to the non-fee-paying students. Moreover, non-fee paying students are more independent when it comes to choosing courses compared to fee-paying students. Lastly, do students think that they have enough choice? All students feel that there are not enough choices to choose from. In fact, nobody feels totally satisfied with the number of choices. This result is contradictory because, in Sweden, students can apply to courses from all universities in the country. Therefore, it is likely that people do not know the number of choices they have (Appendix C.3). Lastly, the answers to the criteria related questions (Appendix C.3) indicate students are likely to choose courses that help towards future career goals and their relevance in the working field are most important, next to their interest in the subject. The results, on the other hand, also show that difficulty and the connection with the lecturer are less important for all students.

After the data-gathering phase, we concluded that when moving on, some information from the quantitative analysis was less helpful for us than the results of the other activities we had done. The most valuable aspects we considered were the differences between the answers of fee-paying and non-fee-paying students on the semantic differential questions on information, feelings, and criteria. We used these to compare and validate the results of focus group and thematic analysis.

3.2.2. Thematic Analysis

Our thematic analysis ended up giving us four themes from the university staff interviews and seven themes from student focus groups and qualitative sections of survey questions.

The university staff transcriptions led us to make clusters of codes, into these specific themes: “Master program design” (1), “Approach to informing students” (2), “Common issues for students” (3), and “Systems used, procedures in place and useful, practical information” (4) (see Appendix A.1). The two most important themes for us were theme (2) and (3), which included many popular tags that we decided to focus further on in making our design requirements. Examples of this are the tag “Fee-paying student problems” (theme 3) that

were mentioned five times in total from our interviews, or “informing students on application process” (theme 2). With such insights, we knew we had to think hard about how to improve the fee-paying students' experience in the application process.

The specific themes from the students were: “Issues: Lack of info” (A), “Issues: Course planning” (B), “Issues: Master program rules and design” (C), “Advantages: Students Perspective (D), “Course selection strategy and criteria” (E), “Suggested Ideas” (F), and “Feelings and Emotions while choosing courses” (G) (see Appendix A.2). Theme (A), (C), and (E) ended up being the most important themes to focus on, counting the amount certain code tags were mentioned in every theme group. The tag “unclear rules” (C) was the most popular tag, coded 21 times, which meant that we as designers would have to create an application where the rules of the elective process should be visible and easy to find. Similarly, “senior to junior student interaction” (E) and “choosing based on career goals” (E) tags inspired us to design user incentives in our design.

3.3 Post Analysis

3.3.1 Personas

After the thematic analysis was done, we used the acquired themes to build five personas (Appendix E). The personas represented the different types of users that took part in our survey, interviews, and focus groups. Their different characteristics, goals, frustrations, and other individual attributes placed the participants into three student personas and two university staff personas. These personas guided the generation of requirements needed for our ideation process, which in turn led to wireframing. Through the use of personas, we could better understand the needs of our users and became a tool of reference to constantly refer back to throughout our later stages of this project (Benyon, 2013).

3.3.2 Requirements elicitation and prioritization

Like previously mentioned, with personas completed, the next step was to use them to generate requirements. The MoSCoW framework was used to prioritize the requirements. All requirements are listed in Appendix F.

4. Design Process and Execution

4.1 Ideation Methods

Originally, our plan was to ideate, using brainstorming and “mash-up”, but this plan had to be updated on the fly. Mash-up is a good practice but ended up being too broad of a technique. We realized that we were too far in the process to efficiently use mash-up and instead decided on using braindumping. Our ideation process started with us brainstorming the more foundational issues of our design, such as “Will this app be run student-to-student or teacher-to-student (management)” or “Should our application be an extension/improvement of something existing, or should it be something new”? When the foundational issues were discussed, the rest of the ideation process was done through braindumping.

For the braindumping method, we used a digital whiteboard tool called Miro. Each of us had ten minutes to come up with all types of ideas that could potentially end up in our solution. When the time was up, the most interesting ideas were written on a whiteboard and further discussed within the group (Appendix D.7). In the end, we had many concepts, functions, limitations, and issues to think about. This slowly led us to make basic sketches before starting on wireframing.

4.2 Sitemap and Wireframes

Based on the ideation phase and the initial sketches made on the whiteboard, the process of making wireframes started. All wireframing and prototyping were made in an application called Figma. Wireframes illustrate an overview of the flow and structure of interactive solutions (Benyon, 2013). In order to have an easy workflow, we first created a sitemap (Appendix D.3). The sitemap gave us a clear view of the structure of the design, and how every page should be connected to each other. Our wireframes were done in high fidelity, which is detailed and could have information on interactive functions. Appendix D shows how the process of ideation on the whiteboard evolved to become a full set of wireframes.

Applying the wireframing process allowed us to see the bigger picture; all ideas put together. This step was necessary, finding issues that we had not planned for and did not require us to go straight into finished details. As a result, we can map out which information and functions are needed for our design. In a way, the wireframes acted as a blueprint for the final prototype.

4.3 Design Language

Design language helps us make the process of designing complex products simplistic by bringing in the power of reusability. It provides consistency in the products and generates a concrete design. It also helps to streamline the design process and increases the productivity and efficiency of designers (Benyon, 2013).

Colors

Apart from making a design aesthetic, colors play an important part in triggering emotions when someone views or interacts with a design. So it is important that we choose colors that are user-friendly and accessible to users who have visual disabilities (Fanguy, 2018).

We selected purple, and orange as the primary and accent colors respectively. Purple was chosen to bring in a sense of calmness and peacefulness whereas orange can bring a sense of excitement and happiness (Ines Santos et al., 2017). We also included the red, yellow, and green colors to represent the error states. The final palette Appendix D.6 was built using coolors (https://coolors.co). All colors were checked against eight different color blindness types and we made sure the colors have a sufficient contrast ratio to make them accessible.

Typography

We chose a sans-serif font “Work Sans” to be used while designing. It is a free-to-use, open-source font from Google Fonts. The font supports variable font weights which is useful for us to bring in a visual hierarchy in the user interface and help the users identify groups of related information. Text styles were created in Figma with standardized properties like font size, font weights, line heights, etc. for different textual elements like headings, labels, and paragraphs and applied while designing.

UI Components
Components used in the user interface like buttons, headers, cards, form controls, etc. were designed from scratch so that we can apply our design language to have a consistent look and experience across the application.

4.4 Hi-fi Prototyping & Interactions

We used Figma to convert all the wireframes into Hi-Fi interactive prototypes. We designed the user interface with the use of our design language. Once all the screens were designed, interactions were added to bring in the navigation between different elements and modules within the application. The full prototype can be found here.

4.4.1 Main Features of the Prototype

This section highlights the main features of our design solution:

Peer-to-peer platform: From the interviews with the university staff we found out that making changes within the academic environment and processes is very slow and difficult. We realized that we cannot wait for the university to fix the problem we are trying to solve with this project. Therefore, we decided to design a platform run by students, for students. A web app in which students themselves can upload the content they think might be useful for other students in the future such as course reviews, example projects, teacher review, internship experiences and more.

Loop of contributions: Once we decided to follow the peer-to-peer philosophy, we realized there were some possible barriers for it to work. One of the biggest and crucial ones was making sure students had enough incentive to contribute to our site. To try to solve this we decided to create a loop of contributions (Figure 1, right) that gives an incentive to all parties to contribute to the platform. By locking some part of the content until enough contributions are made from the user, we expect to ensure the growth of the platform.

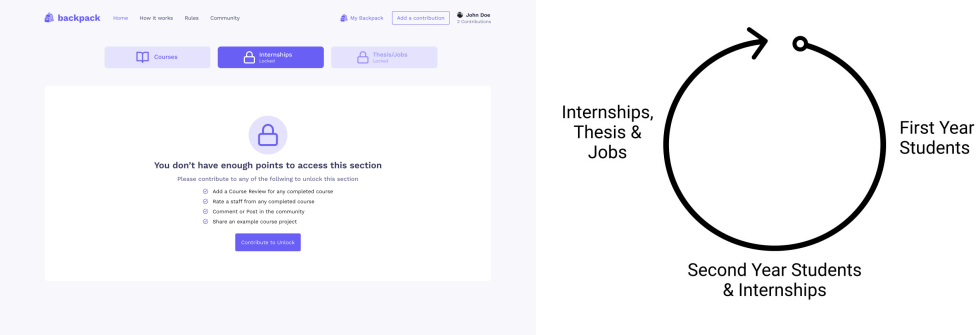

Figure 1 - Locked content and Loop of contributions

Shopping experience: As mentioned during the theory section, because of the overwhelming number of choices of courses choosing electives can be compared to an online shopping experience. Because of that, we implemented features familiar to users from online shopping. Some examples are the shopping cart, which in our case is a backpack, the course list similar to a shopping list and the recommendation of similar courses when the user is looking at a course (Figure 2, left).

Community: Choosing electives alone can be a hard process. Our research has found that students want to get in touch with other students with similar interests and exchange information. Because of that, the community idea was incorporated in our design solution (Figure 2, right).

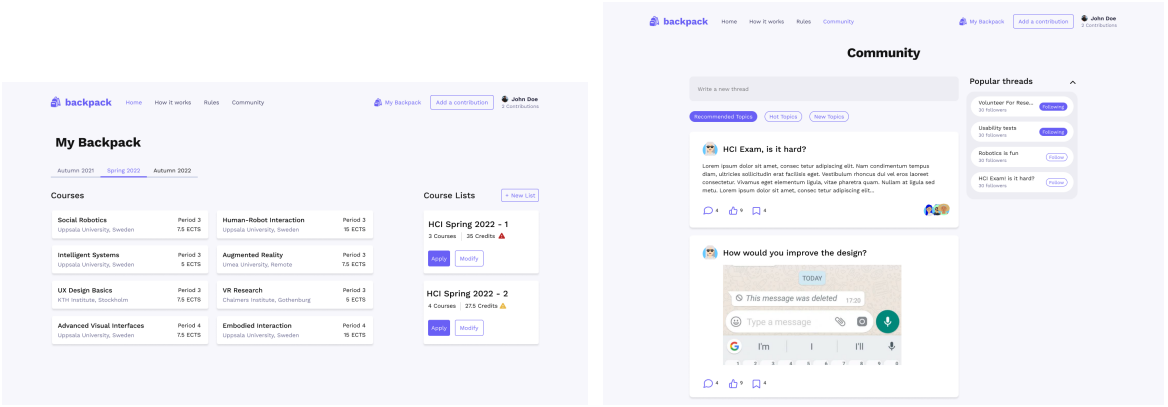

Figure 2 - My Backpack (left) and Community (right)

You know who to contact: During the focus groups sessions, many participants expressed that they had lack of information regarding who they should contact for each of their doubts. We found out from the university staff that currently access to senior students is not facilitated in any way. Also sometimes it is not clear which staff member or teacher to contact regarding a course. In our design solution, we show this type of information clearly. In the user profiles of students we share which courses they have followed already so students interested in these courses will know who to contact (Figure 3, left). In the 'Rules' page we show the contact details of the university staff.

Graphical course designer: One of the main issues found during the focus group interviews

was related to course schedule design. Especially fee-paying students have a hard time designing their schedules so that they can have exactly 15 credits each semester. Because of the fear of extra costs they often contact university staff about related issues. For this reason we decided on creating an easy-to-use graphical schedule design tool (Figure 3, right).

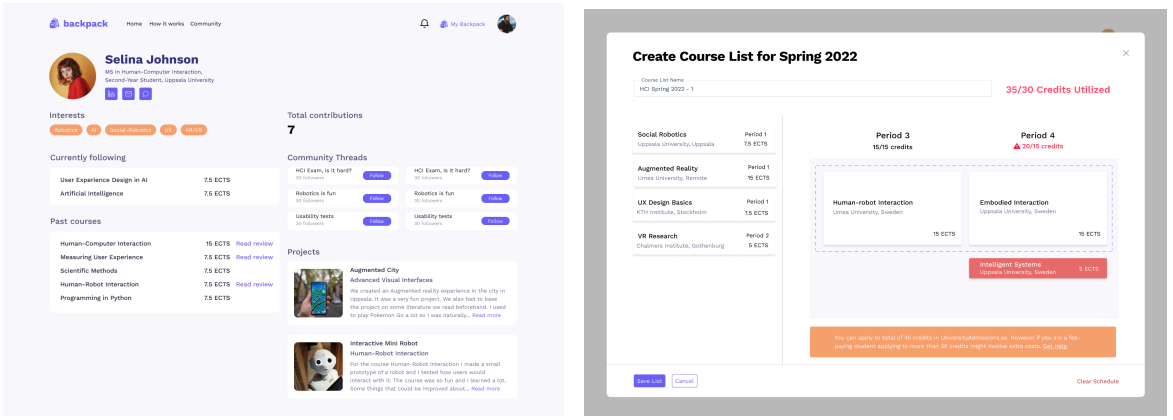

Figure 3 - Student Profile (left) and Schedule Designer (right)

Personalization for better course finding: Our data shows that the average HCI student does not know what to do exactly in the future. They normally just know that they are interested in a specific field. Therefore, we created an onboarding page in which students can pick their favorite fields (Figure 4). This lowers the overwhelming number of choices they are faced with and helps them find more suitable courses.

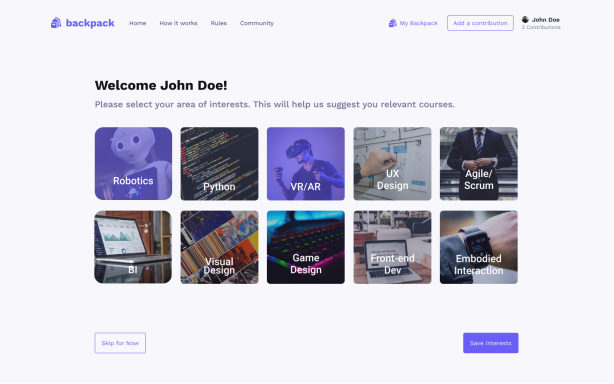

Figure 4 - Onboarding

Suggested improvement of the course presentation: We confirmed during the data-gathering phase that students did not find the zoom presentation of courses useful. The most repeated problems were: the session was not recorded, there was not enough time for each course presentation and project examples were not shown. Consequently, in our design solution we suggest that a pre-recorded presentation of each course should be present along with project examples posted from students (Figure 5, right). With this approach, we also expect an improvement in the content of the session, since the professors will not have to adapt to the time limit of the live session. Moreover all courses can have a presentation without relying on a teacher being present at a specific time slot. We also suggest replacing the current presentation session with a Q&A session.

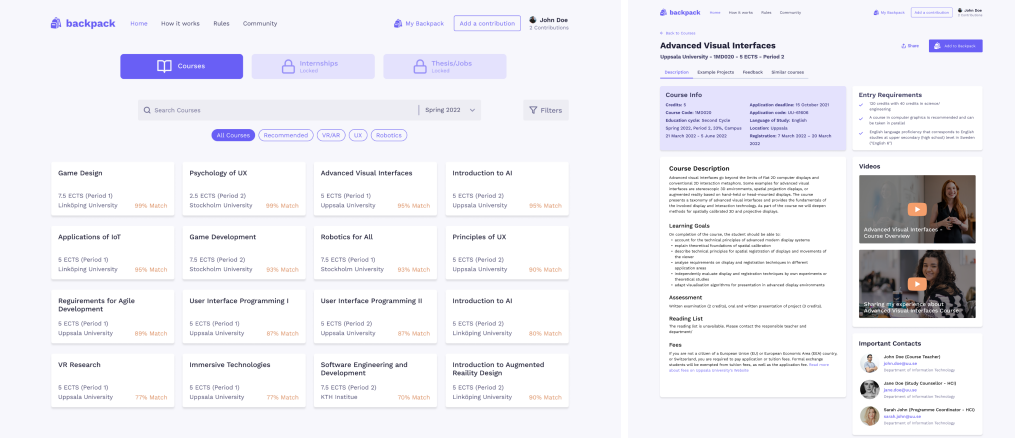

Figure 5 - Home page (left) and Course Description page with videos (right)

5. Evaluation & Improvements

5.1 Methodology

The final step is to evaluate the design. In order to do this, we have done two types of evaluations: participatory evaluation and expert-based evaluation. Participatory evaluation allows representative users to test the design. We have chosen to do moderated cooperative evaluation (or usability testing), in which the participants are co-evaluators. This type of evaluation involves giving the users several tasks and during each task, the participant thinks aloud by explaining what he is thinking and doing, and why he does so, and difficulties he encounters (Benyon, 2013). Moreover, this strategy involves post-test questions. For this, we have decided to use the System Usability Scale (SUS), which is used to measure satisfaction through the usability of our prototype. The survey touches upon several aspects like complexity, ease of use, consistency, and learnability. With the ten Likert-scale questions we quickly get an overview of our prototype's usability and satisfaction (Brooke, 1996). Moreover, when applied to small sample groups SUS can still give a reliable overview. This type of evaluation generates a lot of data that we can use to improve the design so that it meets the users' needs before further developing it. The evaluations were done both remotely and in person. Besides the normal tasks in the tests, each participant did a 'five-second test'. This is a very useful method to get the first impressions of our design and determine whether it communicates the correct message. The tasks are listed in Appendix G - 1.1. Tasks.

After the initial evaluation and improvements, we have chosen to do the heuristic evaluation, a form of expert-based evaluation. Initially, we wanted to do another user-based test, however, due to time constraints, this was not feasible. As mentioned by Benyon (2013), heuristic evaluation is a fast and effective method to review a design. This method doesn't require users, which saves time, however, it can't replace them. Besides, doing heuristic evaluation early on allows us to identify factors that impact usability and find errors, saving time and money in the future. We have chosen to measure our design against the ten

heuristics of Jakob Nielsen (Nielsen, 1994). These are a proven set of design principles and count as a basis to test usability.

5.2 Usability Testing

The goal of this test was to find out if representative users understand the application, whether it has an intuitive user journey, and whether the app meets all the information and needs of the users. All tests were done using Lookback (https://lookback.io), a tool to monitor usability tests. Six participants evaluated our prototype. The first participant completed a pilot test. The decision to do a pilot test was made primarily to see how Lookback works (remotely), to see whether we missed something in our planning for the usability test, or tasks that need immediate rephrasing.

Results

We determined the usability of our prototype by looking at efficiency, satisfaction, and effectiveness. Our design got an overall score of 71 on the System Usability Scale (SUS); indicating that participants found that the prototype has 'good' usability.

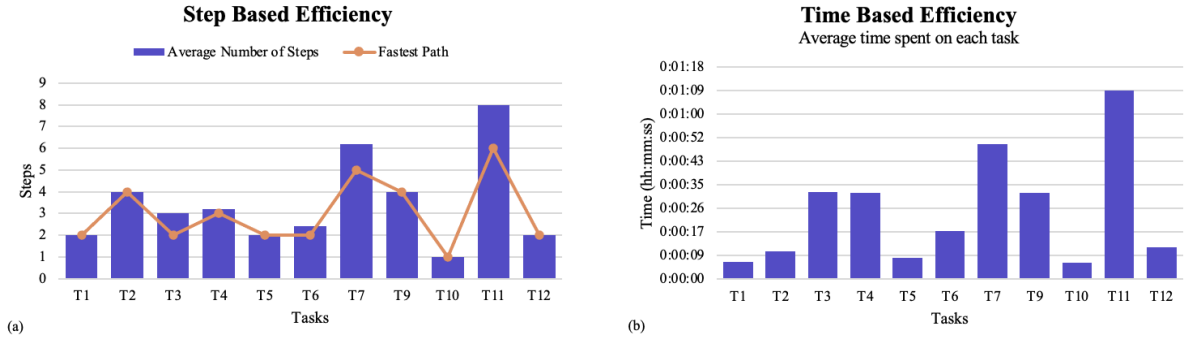

Figure 6 - Task Efficiency

The efficiency tells us about whether participants were able to complete the task in the best possible way without spending much time. In our analysis, we have defined the efficiency by steps and time. Although some tasks were a bit longer, three tasks were more time-consuming and required more steps to complete than expected. By combining all results shown in Figure 6, and the users' comments and issues listed in Appendix G, it became apparent that participants were struggling with these tasks and thus required some improvements. The most important issues that were found are as follows:

- The rules of the selection process were difficult to find and must be more visible due to their importance.
- There is too much information on the contributions page.
- The navigation bar doesn't highlight where the user is.
- Participants didn't understand that the 'internship' button is a button that directs them to a list of internships, they think it is a tag or label.

A complete list of issues and proposed improvements can be found in Appendix G - Chapter 2.3 & 2.4.

5.3 Design Improvement

Based on the most critical issues that were found during the usability tests, we have made design changes. Some of the important issues and corresponding changes are as follows:

1. The test showed us that the users cannot find the rules of the selection process easy while this as mentioned before is a very crucial feature and should therefore be easy to find. We improved this by adding the rules as a separate tab in the navigation and making sure it is highlighted where the user is.
2. While a user makes a course list we showed some assistive text indicating that they could drag a course in the field. Unfortunately, this was not visible enough for most users. In the improved version, we made sure it is clear that users have to drag and drop courses.
3. Some users indicated that they didn't know where they were because the navigation bar doesn't highlight the location. We improved this in the next version. Additionally, we added breadcrumbs or navigation links to help users show where they are and how to get back to where they navigated from.
4. Lastly, as mentioned in the previous section, the contributions page was content-heavy. We improved this by making the screen less cluttered and removing any unwanted or unnecessary information.

A complete overview along with before and after pictures can be found in Appendix H.

5.4 Heuristic Evaluation

In order to evaluate the improved version of the design, we performed a heuristic evaluation. The entire evaluation can be found in Appendix I. As you can see in this appendix, we have found three negative aspects in our prototype that could still be improved. But overall we got an average grade of 4.67/5 in the evaluation of our design.

Regarding the possible improvements that we could do, we highlight the following ones:

- We have very few places in which we show a user's progress.
- We are building an application for International students coming from various linguistic backgrounds. Currently, the entire UI is based in English, and to make it localized we have future plans to show the UI in multiple languages.
- Users cannot easily remove courses from their backpack.

6. Discussion

During our research, we have uncovered several critical points that affect the students' selection process of elective courses. This has given us a clear picture of what students need and are missing in the current process and systems. Using the results, we have created a solution called 'Backpack' in which we tried to solve the problems found. This solution is not something that is newly invented but builds on parts of the existing information and systems (e.g., antagning.se and uus.se) and adds to it several important features. Firstly, the solution makes the information more accessible by combining all information from the different systems in one place making it easier to find. Besides the already available information, we provide students with extra information on courses, like example projects and student

reviews, but also provide a way to see available internships and jobs related to the field. Secondly, our solution offers personalization by recommending courses based on the student's interests. Thirdly, there is a community section that offers students to talk to each other and discuss topics with the same interests. Lastly, our solution has organization tools. With this tool students can not only make different lists of combinations of courses, they can also preview how their schedule will look and whether there will be any overlap in courses.

Backpack can increase student satisfaction with the course selection process and their program. Each student is unique with different goals and therefore we have to account for these differences as well in the design. Depending on the different types of students—fee-paying, non-fee paying, maximizer, or satisfier—this solution allows them to find the information they require in their decision-making. On this account, we believe that students will have an easier and less stressful time selecting courses.

The name and logo are carefully chosen so that it is easy to remember for users. 'Backpack' is a good metaphor that symbolizes that selecting courses is like a shopping experience—'adding courses to your backpack'—as discussed by Schwarts (2004).

Throughout the project, we have however stumbled upon some weaknesses to our design and solution that we should consider. Course information content needs to be updated regularly or at least after a course syllabus is updated. Ideally, we thought that this could be done by the student union of Uppsala University. However, this may not be feasible as the student unions also have other responsibilities; not unlimited amounts of time. One of the main problems for students was that they have too many sources of information. We are trying to create one common source of information that helps students to simplify the process, but paradoxically we could be creating another system that just complicates the process more. Moreover, students may just want to see the content and not have to contribute to see things. We created a 'loop of contributions' (Figure 1) by which students have to contribute to the site in order to see the content of interest in their next educational or professional step. However, people might not want to contribute at all and then the loop will not work as expected.

6.1 Social Consequences

Backpack provides several positive social benefits for students as our solution hopes to improve the selection process. Education is important and the decisions made by students can have a significant impact on their future. The solution provides information for all types of students whether it be fee-paying, non-fee paying, satisfiers, or maximizers. Fee-paying students have to fulfill some more rules, so especially for them, it is important that there is a clear, easy, and working system that can guide them through the process of selecting courses. These students are generally more invested and have more to lose. Consequently, they experience more stress. By providing all the tools and information the different types of students need, we hope to improve student mental health during the decision-making process, thus decreasing the stress levels.

By creating our design we hoped to put a majority of the important information in one place, but at the same time, we are conscious of the fact that we are producing yet another system. We, of course, hope that this will be a mostly positive change, but it is definitely

arguable that at least initially this would take a lot of time and effort for all users to get used to.

6.2 Ethics

While creating our prototype, we considered many ethical aspects. One aspect we did not consider enough was the university's ethical policy. Being optimistic in our design, wanting to complete all the requirements created from our data gathering, some created content might not fully adhere to the policy of our internal stakeholders. For instance, the type of information that is allowed to be shown about students and courses they have enrolled in.

Each participant in this study signed a consent form before participating and was informed about the study they were about to take part in. Participants knew that they could leave at any time and that their data was stored safely. Similarly, this is also a functionality that we need to add in a future version of our design; make sure that people can remove their data and remove their accounts.

Regarding inclusiveness, with a bigger time frame, we could have designed it to be more inclusive, considering other disabilities than color blindness. For instance, being able to operate the website even if you cannot use a mouse/touchpad or having captions for those with hearing issues or voice-over for those with visual disabilities. Lastly, we should consider if it is ethical to give students even more choices by allowing them to choose courses outside the HCI program, knowing that more choices lead to more stress. The survey results, however, have shown that students indicate that they do not have enough electives to choose from within the HCI program.

6.3 Future Improvements

In the future, our solution requires some more improvements that should be considered. Currently, our design solution is focused on the HCI master's program at Uppsala University. In the future, the solution can be scaled up to include all master's programs and bachelor's programs at the university or even expanded to include all universities in Sweden. This, however, does mean that the necessities of the target audience can vary a lot, therefore we might need further research in order to be able to fulfill all the needs for the different types of students. Moreover, in the current solution both first and second-year students looking for a job, need to contribute to the site in order to see the content of interest for their next career decisions. However, there is still no incentive for employed alumni or even students already working on their thesis to contribute to the site. In the future, a new incentive system that includes these groups could be created. For this, we would also need to consider how alumni can access the system as current students can use the Joint Web Login from the university. Yet, this system is not accessible for former students.

The current design is adapted to the website format, but in the future, this design could be adapted to mobile applications or browsers too, by making it responsive. Furthermore, the website should become available in multiple languages and provide the same information in another language. Lastly, the accessibility of the website should be improved in the future, allowing people with different disabilities to use the website.

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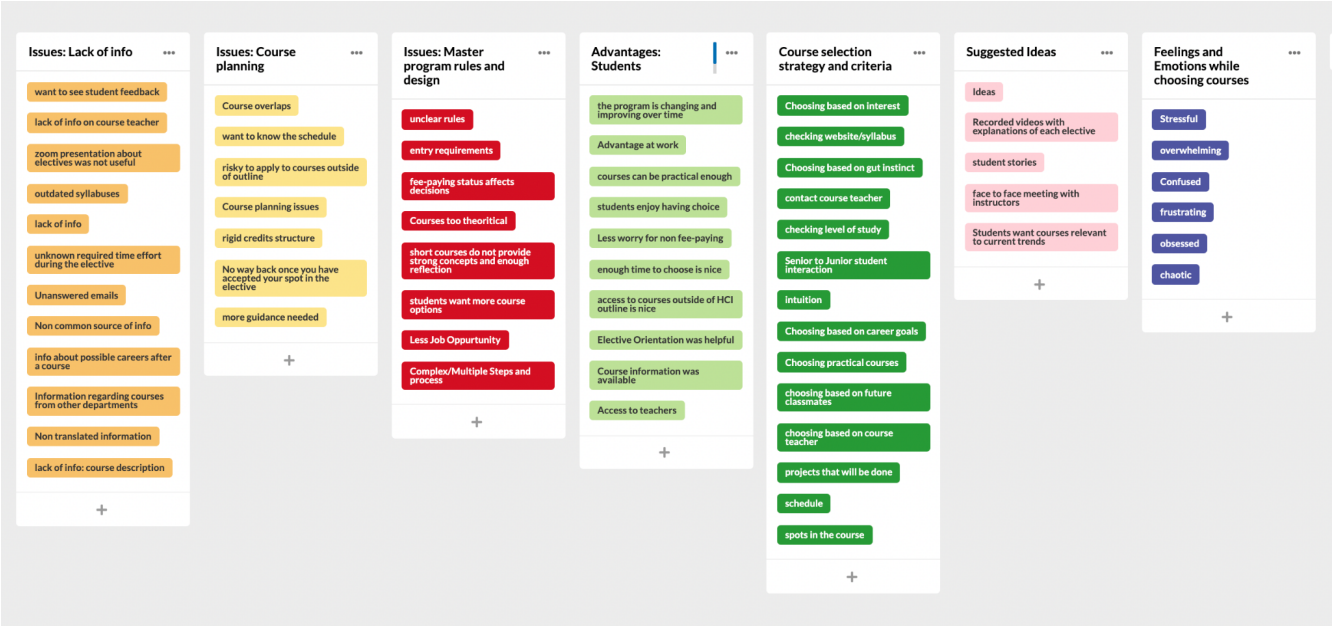
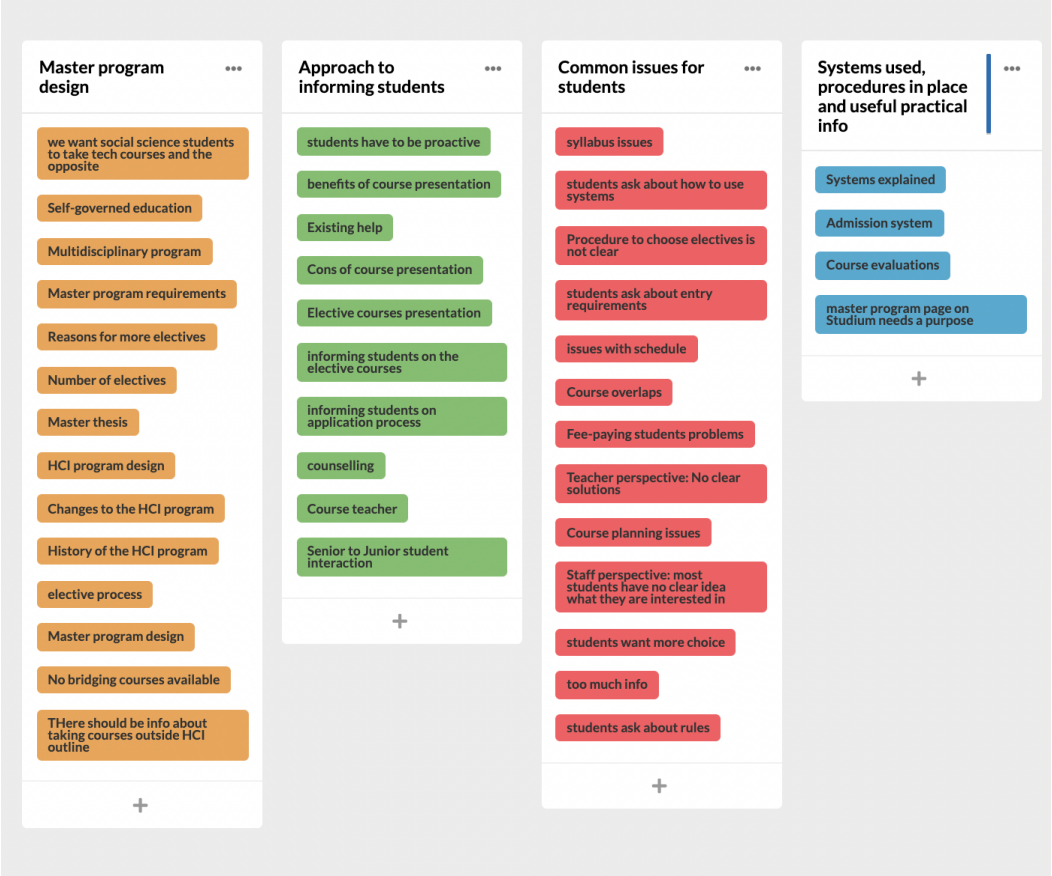
Appendices

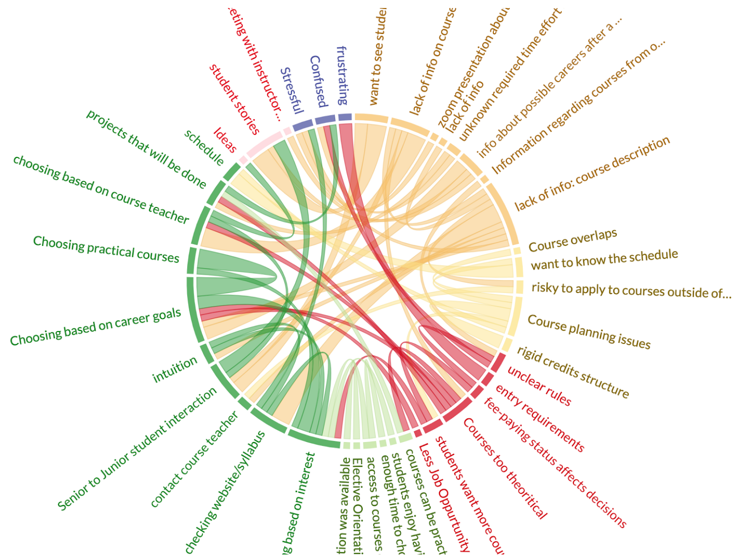
Appendix A - Data Gathering Results



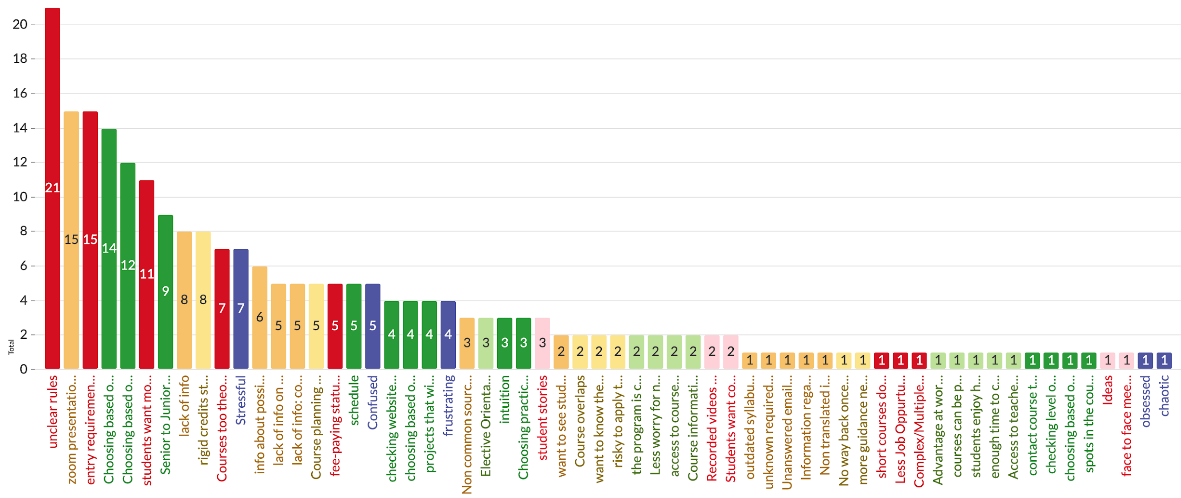
Appendix A.1 - Tags created after students focus groups and surveys



Appendix A.2 - Tags created after interviews with university staff



Appendix A.3 - Overlap between tags



Appendix A.4 - Tag occurrences in the transcription notes

Appendix B - Survey Questions

Background questions

1. Enter your full name
2. Choose your gender
3. What is your year of study?
4. Are/Were you a fee-paying student?
5. Did you receive any scholarships to pursue this program?

Questions for first-year students

6. How far are you with the elective course selection process?

Questions for second-year Students

6.a. How satisfied are you with the electives you took throughout the study?
6.b. Explain how the elective courses you selected affected your satisfaction with the HCI program

Questions for Alumni

6.a. How satisfied are you with the electives you took throughout the study?
6.b. Explain how the elective courses you selected affected your satisfaction with the HCI program
6.c. Are you currently working in a field related to your master's program?
6.d. How much do you think your elective course selection helped you in finding a job or your desired career?

Question related to elective selection approach

7. How much time do you tend to spend thinking about the elective course selection?
8. How likely are you to worry about not making the best choices possible regarding your electives?
9. How many choices did you have when you had to select electives?
10. Do you think your fee-paying status affects your selection process?
11. How independently of your classmates are you making this decision? (checking if they are also joining the course)
12. How happy are you with the elective course selection process?
13. Tell us about your experience with the elective course selection. What was your approach to it? What did you like and dislike about it?

Question related Information received about the electives

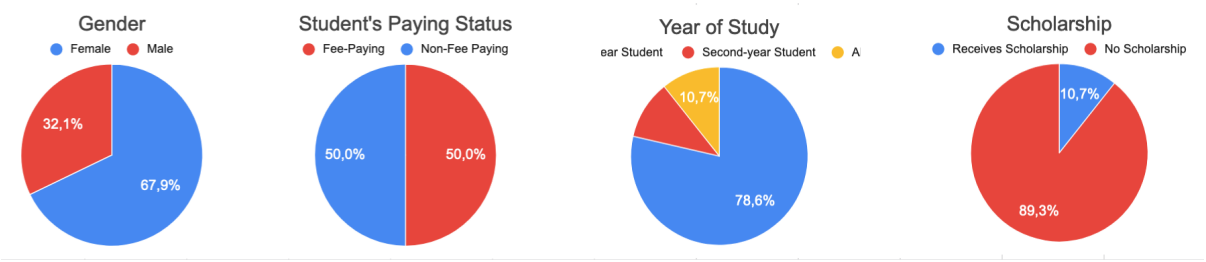
14. How satisfied do you feel with the amount of information you are obtaining while selecting courses?
15. How likely are you to look for extra ways to be informed about specific courses?
16. Where do you get extra information regarding the elective courses before you make your choice?

17. Tell us about what information you are/were missing when choosing and applying for elective courses

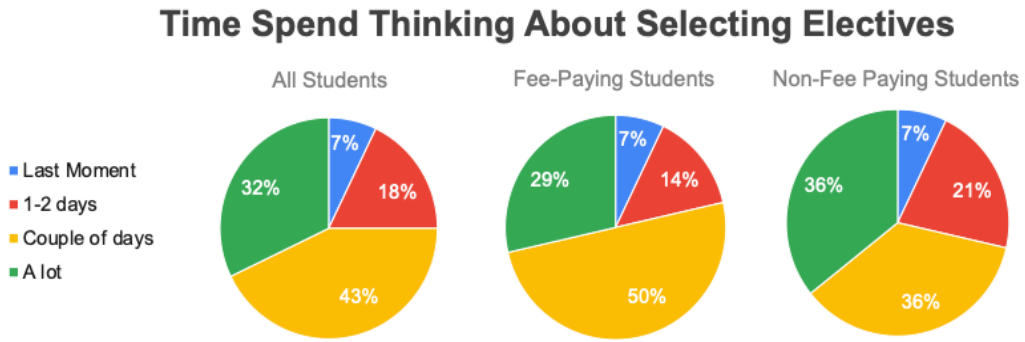
Questions related to the course selection criteria

18. How likely are you to select courses based on your future career goals?
19. How much do you think about a course's relevance in the working environment while selecting it?
20. How likely are you to select courses based on your interest in the subject?
21. How likely are you to select courses based on the difficulty of the course?
22. How likely are you to select courses based on the lecturer that is teaching the course?

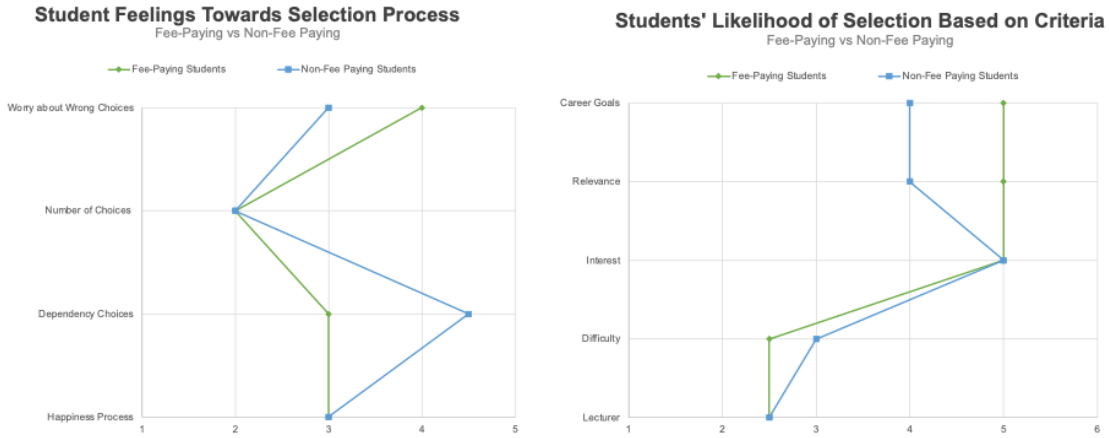
Appendix C - Survey Results Quantitative Data



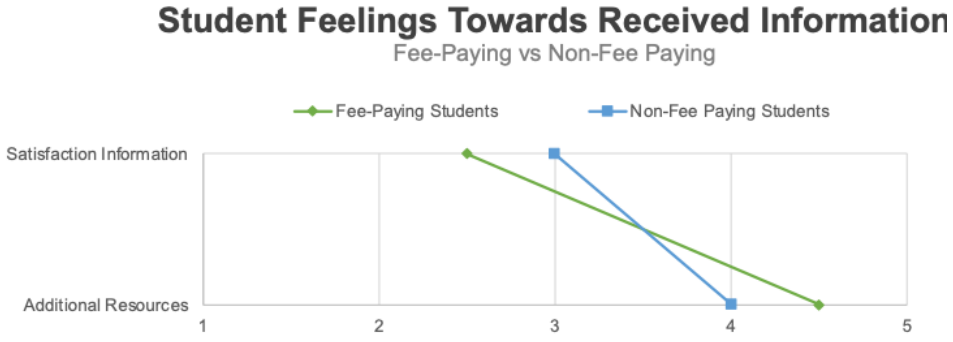
Appendix C.1 - General information



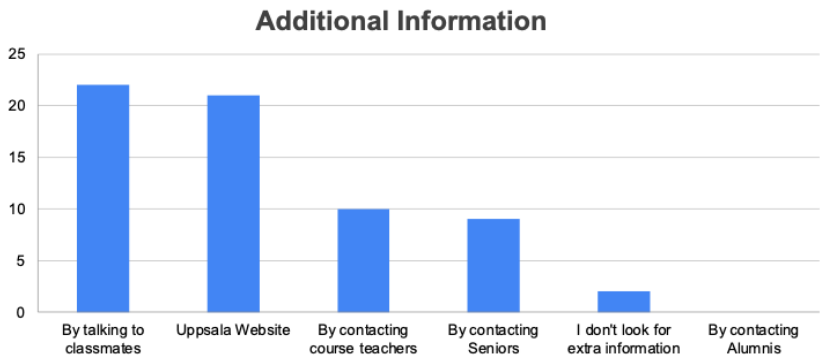
Appendix C.2 - Time students spent thinking on choosing electives



Appendix C.3 - Students' feelings and criteria on the selection process

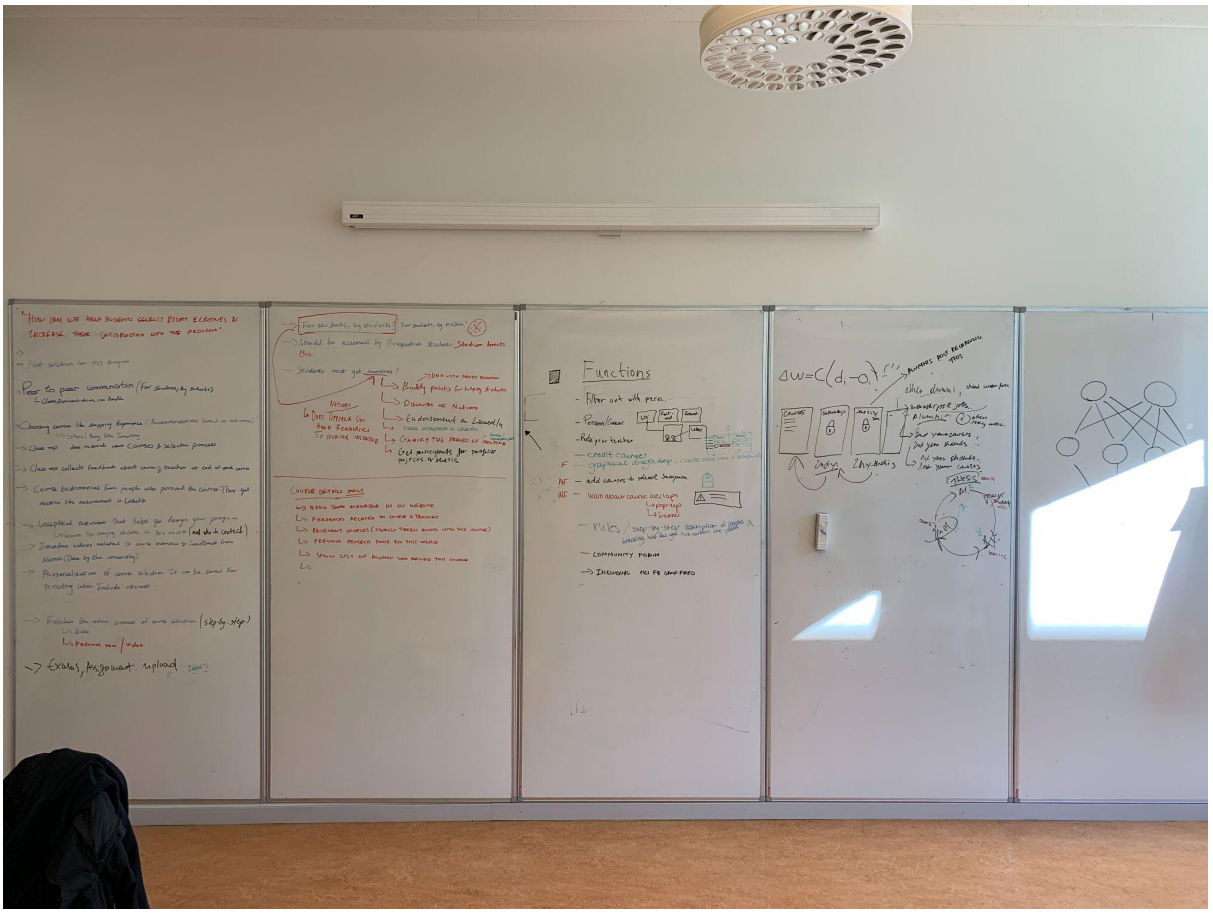


Appendix C.4 - Students' feelings towards the available information



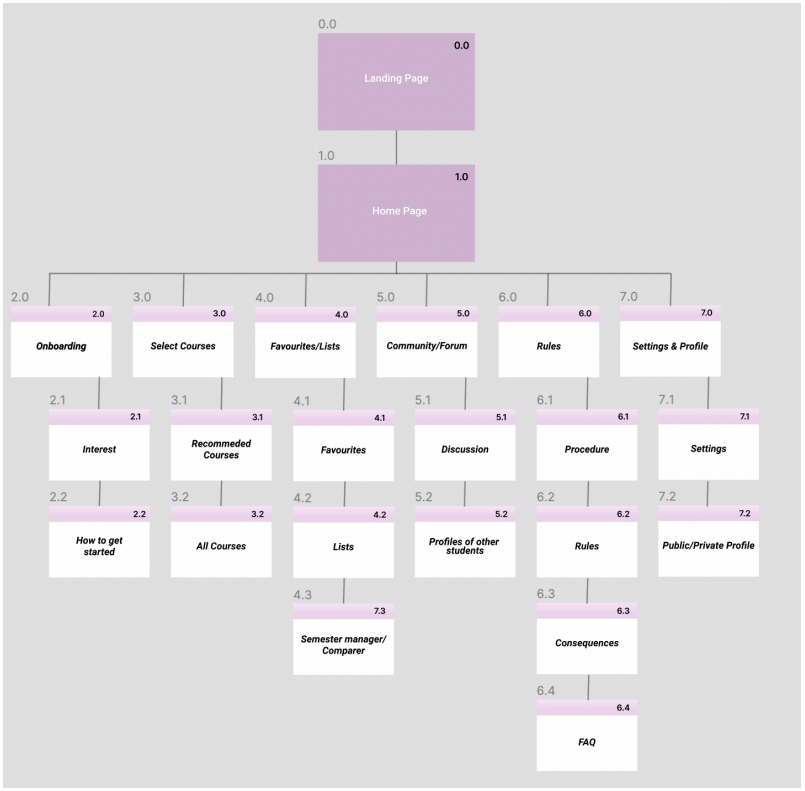
Appendix C.5 - Additional methods students get information

Appendix D - Design

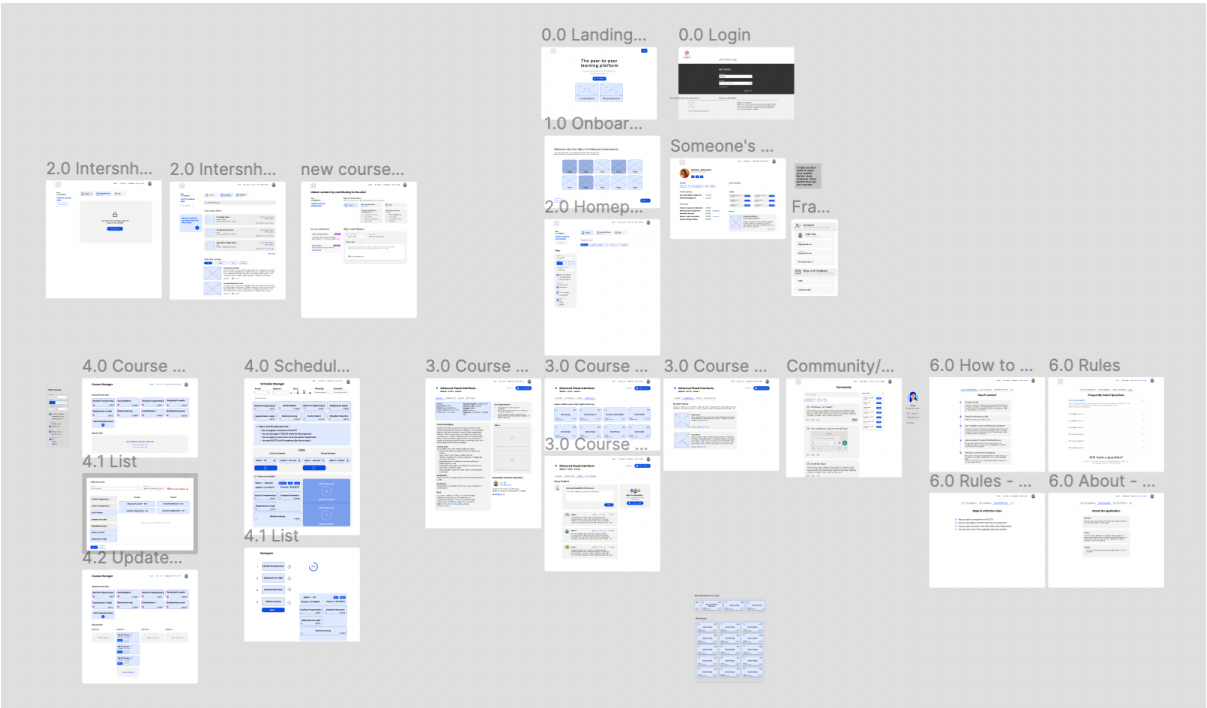


Appendix D.1: Ideation over whiteboard

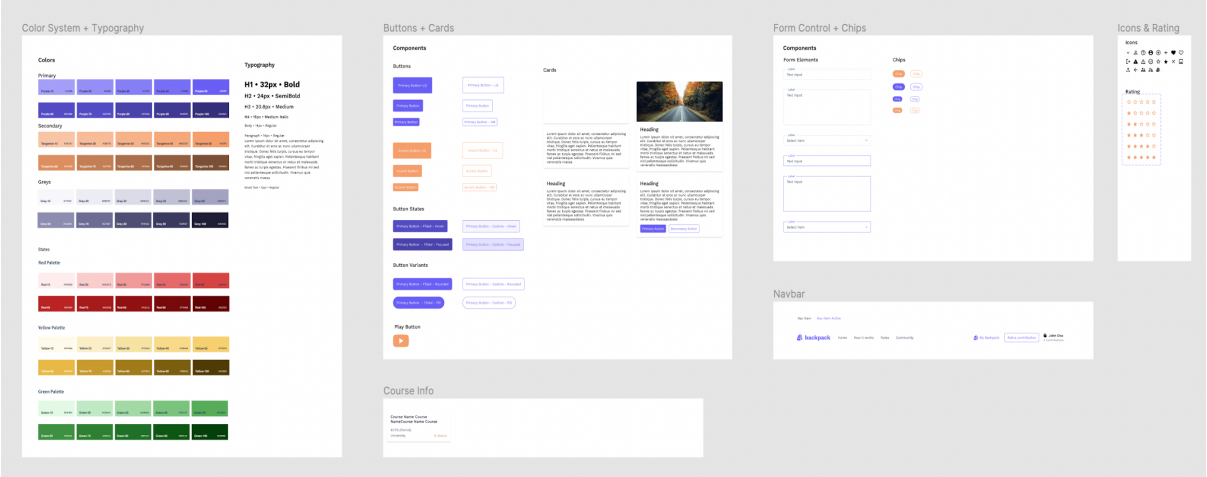
Appendix D.2: Group 8 working on the Ideation phase.



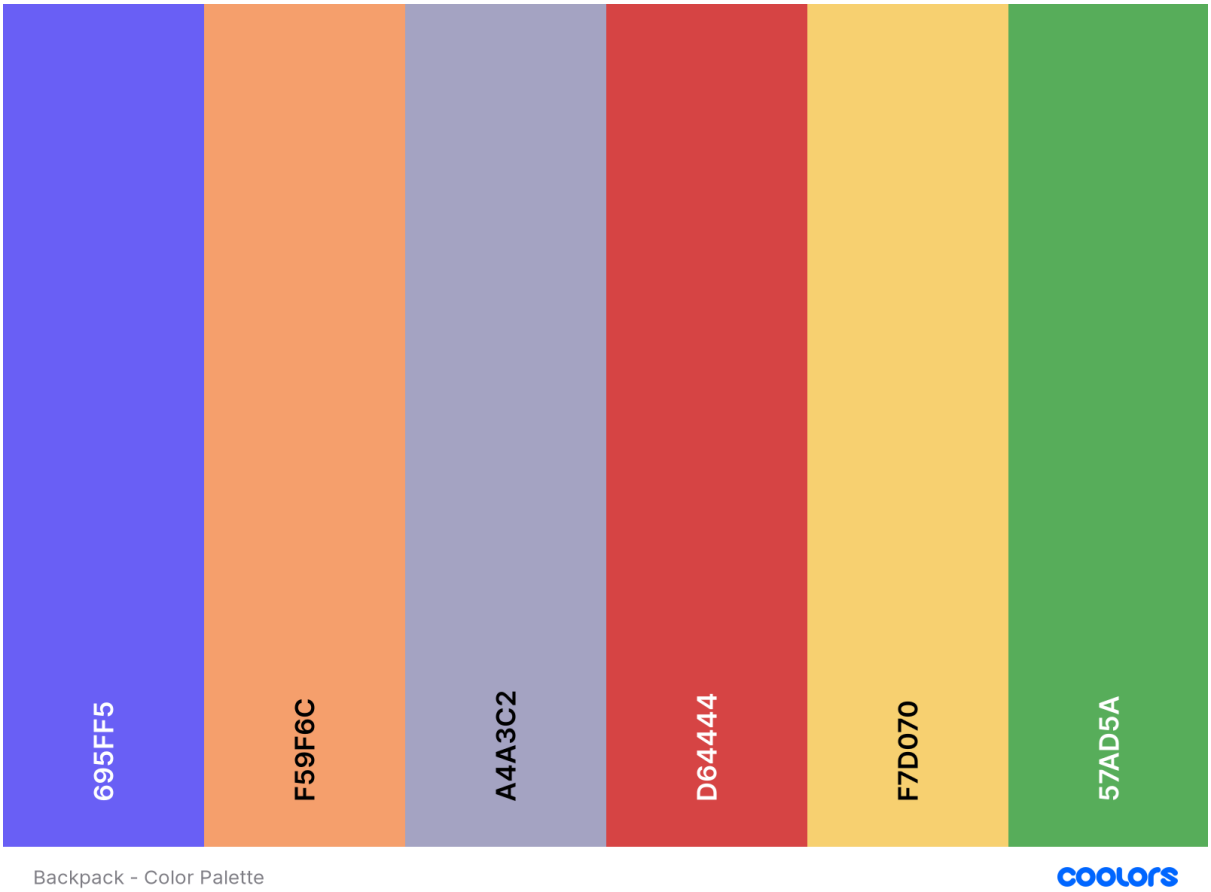
Appendix D.3: Sitemap to help guide our wireframing



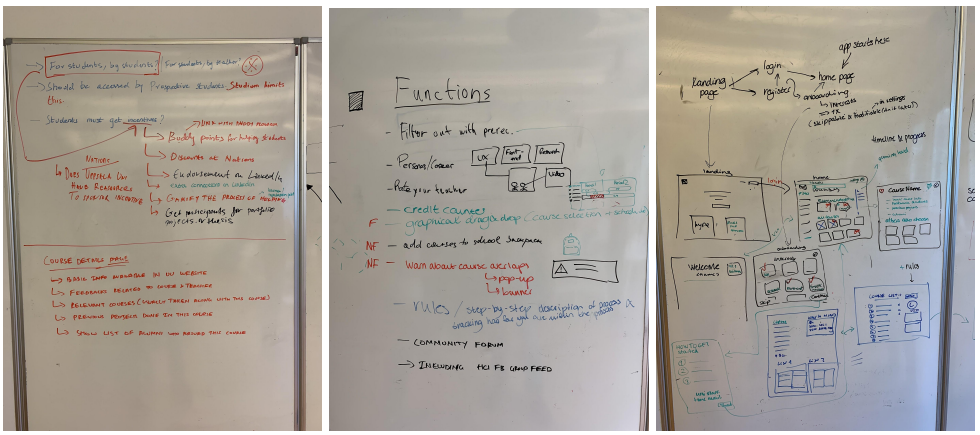
Appendix D.4: Complete set of wireframes



Appendix D.5: Backpack Design System



Appendix D.6: Backpack Color Palette



Appendix D.7 - Ideation session

Appendix E - Personas

Student Persona 1

Personal Info

Name: **Sarah**
Age: **25**
Education: **Master program HCI**
Location: **Uppsala, Flogsta**

Traits: **Fee-Paying Student** **Non-EU** **First-Year Student** **Minimiser**

Personality

Thinks a lot	1	2	3	4	5	Chooses on gut feeling
Stressed about process	1	2	3	4	5	Relaxed about process
Minimiser	1	2	3	4	5	Maximiser

Overview

Bio
Sarah is a first-year Indian master's student at Uppsala University. She does not know how the elective selection process works. She used University Admissions to apply to Uppsala University, but she did not know that you can also apply to courses on the same website. She would like to be guided throughout the process. When it comes to choosing electives, Sarah tends to stress because she does not want to spend extra money. She does not know exactly what she wants to do in the future, however knows that she likes UX. Sarah just wants to attend courses related to her career goals.

Goals
- Stay within budget to pursue the program
- Take courses related to her career goals

Frustrations
- The rules are not clear, therefore, I am practically forced to take courses within the outline because I do not know the consequences of choosing courses outside the HCI program or the university.
- There is no common source of information
- She does not find information that is crucial to her such as rates of teachers, reviews of seniors, "personas" that she can identify with, reports of projects of other years…
- The number of choices within the HCI program

Core Needs
- A list of the basic rules regarding courses you can take and the consequences of having more than 30 ECTS

- A common source of information
- Extra information such as rates of teachers, reviews of seniors, "personas" that she can identify with, reports of projects of other years...

Student Persona 2

Personal Info

Name: **Simon**
Age: **25**
Education: **Master program HCI**
Location: **Stockholm**

Traits: **Non-Fee Paying Student** **EU** **First-Year Student** **Minimiser** **Swedish**

Personality

Thinks a lot	1	2	3	4	5	Chooses on gut feeling
Stressed about process	1	2	3	4	5	Relaxed about process
Minimiser	1	2	3	4	5	Maximiser

Overview

Bio
Simon is a first-year Swedish master student at Uppsala University, studying HCI. He has a good grasp of selection process and the system involved. When it comes to choosing electives, Simon does a short research of the available courses and then chooses based on his gut feeling and interests. In general, he is less worried during the selection process and its outcome. Simon does not know yet which area in HCI he wants to work in, but aims to look for courses that sounds interesting and guesses will be relevant in the working environment. He is happy to just stick with the outlined subjects offered within the HCI program.

Goals
- Choosing courses based on usefulness and relevance in the working environment

Frustrations
- Can't find information on what you can become with the course or which direction you can go into.
- To get ready for the industry Simon cannot find whether a course is theoretically or practically oriented

Core Needs
- Detailed information about the courses within the HCI program, showing the course outline, reading list, schedule, course reviews from previous students, and whether a course is theoretical or practical.

- Information on what you can do with a course after taking it, what kind of area you can go into or what kind of courses are recommended for specific jobs.

Student Persona 3

Personal Info

Name: **Madonna**
Age: **22**
Education: **Master program HCI**
Location: **Uppsala**

Traits: **Non-Fee-Paying Student** **EU** **Second-Year Student** **Maximiser**

Personality

Thinks a lot	1	2	3	4	5	Chooses on gut feeling
Stressed about process	1	2	3	4	5	Relaxed about process
Minimiser	1	2	3	4	5	Maximiser

Overview

Bio

Madonna is a non fee-paying student from the EU. She is someone who is willing to learn things outside the program and wants to explore all possible opportunities available while pursuing her master's. Since she is an EU student she doesn't have any credit limit nor worries about course fees when it comes to applying for courses. So she is utilizing the situation to explore courses from other departments and universities as well.
Since Madonna wants to pursue courses outside the program she has to reach to those staff as well her study counselor and course coordinator who can guide her through the process. She also has to check the prerequisites for those courses.

Goals

- Want to choose and pursue courses from other universities and departments
- Want this process to be informationally rich and happen seamlessly

Frustrations

- Not much information is available regarding taking courses from other departments and universities.
- The process is not clear; it gives a stressed feeling during selecting courses.
- There is not much information available about what happens if we choose more than 30 credits. Should it be chosen within the masters or free-standing courses?
- University staff are not responding back with useful information that can improve the course selection. They are giving generic replies which they claim are due to an overload of questions from students during the course selection period.
- Even though I am interested in certain courses I fail to pass the pre-requisites.

Core Needs

- Information regarding choosing courses outside the program
- Proper guidance and information from staff and study counselors

Uni Staff Persona 1

Personal Info

Name: **Frida**
Age: **52**
Job Title: **Course Administrator**
Location: **Uppsala**

Traits: **Staff** **University administrator**

Overview

Bio

She works with the course administration with some other colleagues. She is responsible for the registration of students to courses. Also, she answers emails from students about general degree requirements and admission procedures. She is not knowledgeable about the subjects within the department she is working in so she directs them to the program coordinator or teachers.

Goals

- A perfectly arranged course schedule
- Satisfied students
- To conduct surveys and publish course evaluation reports

Frustrations

- Outdated and manual systems
- Too many used systems without proper integration

Core Needs

- Students to be well informed on the application process
- Students to be informed about the open office hours of the course administration staff
- Students to know that I am not an expert in the subjects within the department

Uni Staff Persona 2

Personal Info

Name: **Jenna**
Age: **40**
Job Title: **Program Coordinator**
Location: **Uppsala**

Traits: **Uni Staff** **Coordinator**

Overview

Bio

Jenna is in a reasonably junior academic position. She is aiming to improve herself as a researcher. Currently, she is doing 50% teaching and you do 50% research. A lot of her time now is devoted to her own research. She is also responsible for the HCI Masters's program. She reviews all the applications to the master's program and admits students to the program. She is also the head of the HCI unit in terms of staff capability. She works together with the course administrators, but they deal with more practical issues. She is more focused on guiding the students so that they get a complete experience of the program.

Goals

- Having a fully functional Masters's program of HCI.
- Admitting the right students that fit the HCI program.
- Giving students a complete master's experience.

Frustrations

- The many hurdles of bureaucracy in the academic world.
- Dealing with practical issues, not part of her work responsibilities.
- Outdated processes in guiding students
- The administrative difficulty in trying to make the HCI program, which is in two faculties work.

Core Needs

- Students to communicate their problems and frustrations
- Prefers students with a social science background to take some technical courses and students with a technical background to take some social science elective courses
- To interact with students representatives and students for further program and course improvements
- Needs students to be more proactive and take responsibility for their own education

Appendix F - Requirements

The table below outlines all the requirements along with their prioritization.

Id	As a <user>	I want to <need>	To do <objective>	Related personas	MoSCoW	Related Req.
1	Student	know the rules of course selection	Understand the process	All student personas	Must-Have	2,4
2	Student	know the rules and consequences of having over 30 ECTS	Understand the process for EU Students	Madonna Simon	Must-Have	1
3	Student	know if a course which is not included in the program should be selected as free-standing or as within the program	to correctly apply	All student personas Madonna Sarah Simon	Should Have	33
4	Student	know information and rules regarding courses outside the normal program		Madonna	Should Have	1
5	Student	have one common source for information on course electives	have all the needed information in one place and easy to find	Sarah	Must-Have	
6	Student	to be able to do bridging courses	to meet the requirements of certain electives	Sarah	Could Have	
7	Student	get the proper information from/about course coordinators		All student personas	Must-Have	

8	Student	complete information on course regarding syllabus, type, difficulty, prerequisites etc.		All student personas	Must-Have	17, 18, 27
9	Student	know course schedules (see previous years) & get a visual overview for the first and second period of selected courses	check whether electives or exams are overlapping	All student personas	Should Have	
10	Student	know possible career choices after pursuing that course	see if this matches with the interests and career goals	Sarah Simon	Should Have	
11	Student	feedback from people who pursued this course in the past	see if former students liked the course or not, whether they liked it, would recommend it (+for certain interest/career goals)	Simon	Must-Have	28
12	Student	Feedback on the course teacher		All student personas	Could Have	
13	Student	have example/description reports or projects	to see what previous students have done in the course and see whether this course suits my expectations	Simon	Should Have	
14	Student	be able to contact the respective course teacher	to get more concrete and useful information on the course and its contents	All student personas Madonna	Must-Have	
15	Student	have a proper description and outline of the courses within the HCI program		All student personas	Must-Have	29, 32
16	Student	know which courses are helpful for other courses within the HCI program/ to do these courses		All student personas	Won't Have	

17	Student	have up-to-date course content		All student personas	Must-Have	8
18	Student	have the same, correct, up-to-date, and all information in English as it would be in Swedish	get all possible information	Madonna Sarah	Must-Have	8
19	Fee-Paying Student	the same flexibility as non-fee paying students	to be able to do more courses that suit me and extra courses without paying way more	Sarah	Won't Have	
20	Student	know that I have a try-out period/ have a possibility to switch courses	to see if a course is for you or not. and switch to other courses	Sarah	Could Have	
21	Student	have a fixed schedule (lectures on the same day)	be able to properly plan other activities outside of university	All student personas	Won't Have	
22	Student	have the prerequisites to be more clear		Madonna	Should Have	23
23	Student	Prerequisites should match with the difficulty and content of the course		Madonna	Won't Have	22
24	Student	The application process should be clearly described and listed	Understand and refer to which steps to take in the process and which I still need to do	All student personas Madonna Sarah	Must-Have	
25	Student	proper guidance and counseling	to see the possibilities of electives with my bachelor courses and/or working experience	Madonna Sarah	Could Have	
27	Student	know about the course content (current presentation is not good enough)	to see if it is interesting for me	All student personas	Must-Have	8

28	Student	be able to ask former students about courses		All student personas Jenna	Should Have	11
29	Program Coordinator	have a purposeful main page of the HCI masters program		Jenna	Must-Have	15
30	Program Coordinator	students to take responsibility for their own education		Jenna	Must-Have	
31	Course administrator	To not have to use even more systems than I currently use for my job		Frida	Could Have	
32	Program Coordinator	To better inform students about the courses offered in the HCI program		Jenna	Must-Have	15
33	Student	have a clear description and guide on how to use the system/University Admissions (tag ⇒ Uni staff-common issues: students ask about how to use systems)	to be able to understand the application process and find all available electives	Madonna Sarah	Should Have	3
34	Program coordinator	Encourage students to communicate when they need help/have issues	to increase student satisfaction and educational system/process feedback.	Jenna	Should Have	
35	Program coordinator	have past course evaluations to be easy to find	So students can get a feeling for course electives before choosing them	Jenna	Must-Have	
36	Student	courses related to trends in the field		Madonna	Could Have	
37	Student	see what courses classmates are registering for	work with people with the same mindset	All student personas	Could Have	

38	Student	Basically to know common courses taken by people after they pursue a course (people who choose this also choose these... ⇒ recommend)			Could Have	

Appendix G - Usability Report

Usability Report

Usability Tests - Backpack Prototype

Test Date: October 22, 2021
Report Date: October 24, 2021
Location of Test: Interaction Lab, Ekonomikum, Uppsala University

Table of Contents

1. Usability Test Plan

In this usability test the initial prototype of Backpack was evaluated by representative users. The tests were held on 22 October 2021 between 10:00 and 15:00 either remotely or at the Interaction Lab in Ekonomikum.

With the test, we wanted to identify what people think of the app, how they think it should work, and identify design issues so that we eventually can improve the design. When no test with representative users is done, we might not only miss several important flaws in the product, we would also not be able to check early on in the design process whether the product meets the user's expectations and needs. Furthermore, usability testing allowed us to get feedback on the product and see the user's success rate when completing a task.

The purpose of the website is to help students to select the right electives during their studies. In addition, this website creates a portal to share information about important things for students such as internships, thesis, or future jobs. With this test, we wanted to find out if representative users understand the application, if it has an intuitive user journey, and whether the app meets all the information and needs of the users.

All tests had a facilitator and an observer. Each group member took on both the roles of facilitator and observer in one of the tests.

Participants
Around 70 people were contacted to do in-person or remote testing. In the end, six accepted to participate in our usability test and evaluated the Backpack prototype. The participants were first-year students of the HCI masters' program at Uppsala University. Four out of six were fee-paying students and there was a 50/50 distribution between men and women. We initially performed a pilot test to see how Lookback works remotely if we could improve in the usability test, or tasks that need rephrasing. Only the comments of the first participant will be taken into account. The usability, step counts, and times are not representative of the real user.

Procedure
The following procedure was followed during each test:

1. Set up the session in Lookback. In case the test was done remotely the participant was sent an invite link to Lookback so we could monitor their screen and face.
2. Welcome:
    - The participant reads the welcome message
    - The participant fills in the consent form
3. Testing:
    - The participant does a five-second test to test their first impression of the landing page
    - The participant carries out several tasks (see 1.1 Tasks)
4. Wrap-up:
    - The participant is asked some follow up questions
    - The participant fills out the post-test survey that helps determine the overall satisfaction

1.1. Tasks

Table 1 underneath outlines the tasks that the participants were given.

#	Task	Expected Optimal Route	Steps
0	Look at the screen for 5 seconds. What do you remember from looking at the page?	N/A	N/A
1	Login	Start on the landing page: - Click login - Fill in the credentials - Click login	3
2	Do the onboarding. Robotics, AR/VR, and UX are your main types of interest.	Start on the onboarding page: - select AR/VR, Robotics, and UX - click save interests	4
3	Try to find the rules of applying to courses within HCI.	Start from the home page: - click how it works - click rules selection process	2
4	Go back home. Explore courses that are within the field of VR/AR that can be freestanding, outside of Uppsala University, or within the UU HCI program.	Start on the home page: - click AR/VR - select UU freestanding courses - select courses outside UU	3
5	View the course description of Advanced Visual Interfaces course and find example projects in the course	Start on the filtered home page: - select advanced visual interfaces - select example projects	2

6	Find out which other courses Selina Johnson from the first project took and read her review on Human-Robot Interaction	Start on the example projects page: - click on the name or picture - click read review on Human-Robot Interaction	2
7	Add Human-Robot Interaction to your backpack and create a course list with: Embodied interaction, Human-Robot interaction and Intelligent systems.	Start on the HRI feedback page: - Click on add to backpack - click on create a list - drag Embodied - drag HRI - drag Intelligent systems	5
8	Question: What is happening on the screen? What seems to be possible options from here on?	N/A	N/A
9	Save the list and Go back to “Home”. Now try to join a discussion in a thread about Robotics.	Start from schedule page: - click save - click home - click community - click follow	4
10	Go back home. Now try to find internships. What would you do now?	Start from the community page: - (click home) - click internships	1
11	Add a course review on the Human- Computer Interaction course for an extra point. And now view internships.	Start from the ‘unlock’ page - fill in the form - click submit for moderation - go to internships	6
12	Apply to your only list of courses	Start from home page: - click my backpack - click apply	2

Table 1 - Tasks

2. Findings

The first part of this chapter discussed the usability of our prototype by looking at the efficiency, satisfaction, and effectiveness. The final part of this chapter outlines the major issues participants encountered and the corresponding solutions that were made. *The results of the first participant are omitted in sections 2.1 to 2.3.*

2.1. Efficiency

The efficiency tells us about whether participants were able to complete the task in the best possible way without spending much time. In our analysis, we have defined the efficiency by steps and time.

Step Based Efficiency

The step based efficiency explains how many steps users take compared to the most optimal and fastest path to complete a task. This can be calculated by comparing the participant's performance to the optimal flow. Figure 1(a) illustrates the results of this comparison taking the average steps from all users. On average the majority of the tasks were completed as anticipated and followed the route that was set out beforehand (see Table 1). Tasks three, seven, and eleven, however, showed that participants needed some more steps before they found the right screen or information.

Time Based Efficiency

This metric records how long it takes for users to achieve their objectives and tells us which parts take longer than expected and thus may require improvements. For each participant, we have much time they spent on completing a task. Per task the average time spent was calculated, the results are shown in Figure 1(b). Tasks seven and eleven were on average a bit more time-consuming for participants than anticipated. However, these results correspond with the results shown in Figure 1(a) and may indicate some parts of these tasks should be changed.

There are two constraints on the time-based results that should be taken into account:

- Those tasks requiring 'writing' actually indicate clicking a text field and therefore seem shorter. The 'writing' functionality is not possible in the initial prototype.
- The results may not be completely reliable as we did not take a reference time before.

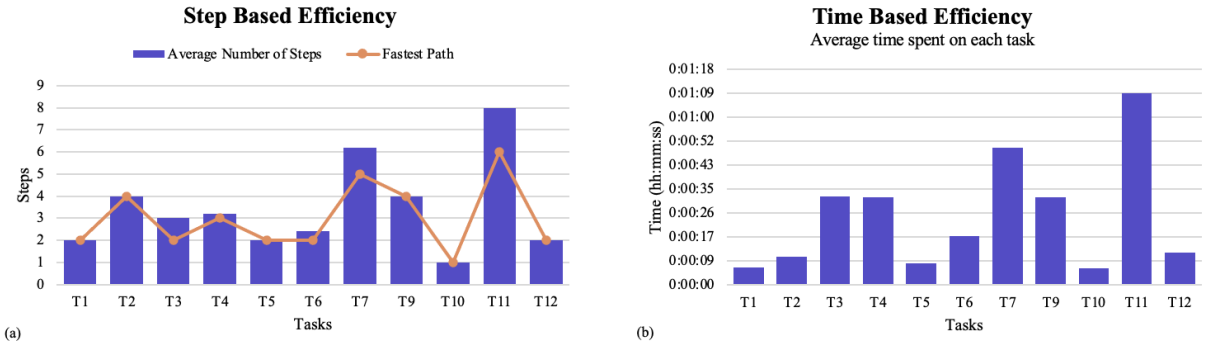


Figure 1 - Task Efficiency

2.2. Satisfaction

We have determined user satisfaction through the ease of use of each task and through the usability of the overall design and prototype.

Usability

We have used the System Usability Scale (SUS) to measure satisfaction through the usability of our prototype. The survey touches upon several aspects like complexity, ease of use, consistency, and learnability. With the ten Likert-scale questions we can quickly get an overview of our prototype's usability and satisfaction (Brooke, 1996, p.189-194). Moreover, when applied to small sample groups SUS can still give a reliable overview. SUS scores can be divided into four groups:

- 50 and under is 'poor'
- between 51 and 70 is 'fair'
- between 71 and 84 is 'good'
- scores from 85 and higher indicate 'excellent'

Our initial prototype got an average SUS score of 71. This result indicates that participants found that the prototype has 'good' usability.

Ease of use

Each participant was asked to specify how difficult they found the task after completing it from one (very difficult) to five (very easy). Based on their feedback we have determined the user satisfaction based on the task difficulties. The results are presented in Figure 2. The average satisfaction of all tasks is four, meaning participants found the tasks generally easy to complete. The graph below indicates that there were three tasks that were not as easy to complete.

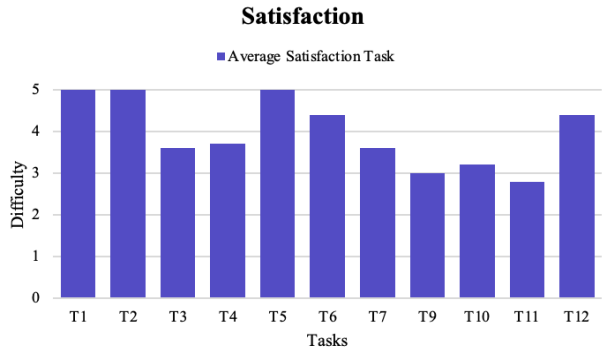


Figure 2 - Task Satisfaction

2.3. Effectiveness

By determining the effectiveness we can see how accurately users complete a task. All users completed the tasks in one way or another, however it is noteworthy to divide their success and failure rates into different categories. Eight out of eleven tasks resulted in a complete (or direct) success, meaning all users were able to complete the task correctly. Yet, tasks three and seven were on average completed indirectly as they, in most cases, required users to follow slightly more steps as expected (e.g., a participant initially goes to the wrong place). This may indicate that some parts of the information that participants were looking for were not placed in a clear spot.

Combining the results shown in Figure 1, Figure 2, and the users' comments and issues (see section 2.3), made it very clear that participants were struggling with this task. Around 60% of the participants were not able to complete the task successfully on their own or without help.

2.3. Issues

The table below lists the most important and common issues that were mentioned by the participants.

#	Issue	Page	Mentions & Severity
1	The rules of the selection process were difficult to find and must be more visible due to its importance	How it works - rules selection process	5/6
2	It was not clear that the top (chip) filters are filters/buttons	Home	2/6
3	The naming of some filters is not clear	Home	1/6
4	The past courses and read review button is less visible, participants assumed it is under the (corresponding) project picture as it draws more attention	Profile	2/6
5	Course list may become invisible without scrolling down when a user adds a lot of favorite courses	Backpack	2/6
6	Participants indicate that the assistive text instructing to drag a course is not clearly stated/visible.	Backpack - course list	4/6
7	Participants cannot remove a course from a course list or from their backpack/favorites	Backpack - course list	1/6
8	The prototype shows error message directed to fee-paying students to non-fee paying students	Backpack - course list	2/6
9	It is unclear what is required to get points to unlock sections	Contribute	3/6
10	There is too much information on this page (making the important part, adding a review, to draw less attention)	Contribute	4/6
11	It is not straightforward why some content is locked and what contributions are	Contribute	2/6
12	participants didn't understand that the 'internship' button is a button that directs them to a list of internships, they think it is a tag or label	Contribute	4/6
13	Quick links to join threads about specific topics related to a course	Course description	1/6
14	Participants do not know where they are	All	1/6
15	The navigation bar doesn't highlight where the user is	All	1/6

Table 2 - Problems

2.4 Task scores

Task No.	Task	Average Score
1	Login	5
2	Do the onboarding. Robotics, AR/VR, and UX are your main types of interest.	5
3	Try to find the rules of applying to courses within HCI.	3,6
4	Explore courses that are within the field of VR/AR that can be freestanding, outside of Uppsala University, or within the UU HCI program.	3,7
5	View the course description of the Advanced Visual Interfaces course and find example projects in the course	5
6	Find out which other courses Selina Johnson from the first project took and read her review on Human-Robot Interaction	4,4
7	Add Human-Robot Interaction to your backpack and create a course list with: Embodied interaction, Human-Robot interaction, and Intelligent systems.	3,6
9	Now try to join a discussion in a thread about Robotics.	3
10	Go back home. Now try to find internships. (=locked). What would you do now?	3,2
11	Add a course review on the Human-Computer Interaction course for an extra point. And now view internships.	2,8
12	Apply to your only list of courses	4,4
	Overall Satisfaction	**4,0**

2.5. Solutions

Table 3 outlines the solutions to the problems mentioned in the previous section and whether it has already been implemented in the next iteration of the prototype.

#	Issue ID	Solution	Implemented
1	1,15	Add the Rules as a separate tab in the navigation and make sure it is highlighted where the user is.	Yes
2	6	Make sure it is clear that users have to drag and drop courses.	Yes
3	9	Make sure it is clear what users need to do to unlock sections ‘Internships’ and ‘Thesis/Jobs’	Yes
4	10	Make ‘Add contribution’ the central component of the page and the rest make secondary.	Yes
5	11, 12	Improve the Courses/Internships/Thesis Jobs navigation and clearly show which ones are accessible which ones are not. Also, make sure it looks clickable.	Yes
6	5	Make sure course lists always stay above the fold.	Yes
7	14	Breadcrumbs or navigation links to help users show where they are and how to get back to where they navigated from.	Yes

8	8	When logging in with the Uppsala website we are fetching information about the user. This information such as ‘fee-paying student’ should be visible in a sliding component for user profile and user settings. This will make the user aware of what information the system has on them.	Yes
9	T4	Improve filtering on the home page.	Yes
	T9	Here it appeared that the way the task was phrased caused the participants to have difficulty with the task. Therefore no improvement will be suggested.	Not relevant

Table 3 - Solutions

3. Participant Comments & Issues

This section outlines the comments and issues per participant for each task. When a participant scored a task this is indicated in blue after the comments, one meaning difficult and five being easy.

3.1. Participant 1

5 Second Test - First Impression
Participant saw a welcome page with three links, one to join a community, one for course selection and another one to find internships

Tasks
Question 1 - Login
Participant logs in without a problem. It was very clear (5/5)

Question 2 - Onboarding
Participant knew what to do. Yet initially, she tried to click interests in another order than specified in the instructions which weren't working and forgot to 'save interests'. "it was easy, but because the design is too big and got shrunk, I cannot see all buttons" (5/5)

Question 3 - Rules for applying to courses
The Participant had a very hard time finding the rules. Didn't see 'how it works' and understood it was placed there. (1/5)

Question 4 - Filter and explore courses on Home Page
The Participant struggled with this as well, initially thinking she had to look for a course instead of filtering. Participant only looks at the filters in the column that says filters "I was not looking at the filters on top". "I think it was a bit misleading to have the filters separated in the main page" (3/5)

Question 5 - Find example projects for Advanced Visual Interfaces
Participant could easily navigate to the course description page. She loves the design but is a bit lost. The top navigation bar doesn't show where she is because the text is not highlighted as the tabs on the page: "spend more time on navigation". Next, she would like to see something similar to breadcrumbs because it was "difficult to find out navigation hierarchy". The participant diverted slightly from the task to check out the content on the other tabs within the page. "I like that I can see the study counselor and program coordinator". "the course description is good". In Feedback participant tries to click the pills "teacher doesn't change if you select it. Is this a navigation bar?" Overall the participant found this task easy. (5/5)

Question 6 - Check courses a student has taken and read the review of Human-Robot Interaction
Clicks the user. "the interest in profile feels like I should click it, it looks like navigation bar". The view the review of the course she first goes to the project that is listed of the same course. A participant explains: "I went there first because of the picture it draws more attention, I saw this first compared to the list of the past courses". The participant goes on and completed the task successfully.

Question 7 - My Backpack & Question 8 - What's happening
Participant would like to see a step-by-step process in the favorites. She cannot find the course list and clicks 'add a favorite course'. When understood participant mentions: "I didn't see it. also if there a more favorites the course list part shifts down and then I would have to scroll to add [and see] the course list". The next participant struggles a lot with selecting the courses on the list. However this was mostly due to the fact that the prototype was not working properly and extremely slow on her device, which was not anticipated. When it finally works she is confused "why is a period 1 course added in period 3 and a period 2 course in period 4? I shouldn't be able to add them to these periods."

Question 9 - Join a discussion in a thread about Robotics.
"I don't know where I am" Participant clicks community and follows the thread. Participant mentions "I don't use threads much. I would like to have a quick link to join a thread. Now I have to go to the community to do so." "I need breadcrumbs".

Question 10 - Try to access internships & Question 11 - Adding a course review
Participant doesn't understand the locked content and what the contributions are about. "it's confusing". "this page [add contributions] has too much information. I want to see what I should do next not my past contributions". "Why I cannot access internships and thesis?" "there is way too much information here !" "it's not difficult, but there is too much info that I don't want to see. Adding contribution [review] should be the first thing I want to see".

Question 12 - Applying
skipped - didn't work

General comments at the end of the session

- The navigation is confusing
- My mental model doesn't say the course list is under the backpack
- I want breadcrumbs to see where I am
- The contribute page is information-heavy
- My metaphor for backpack is first traveling other than school
- I like the course description, it's the best page and I like the colors.
- I need to scroll to add a course list

3.2. Participant 2

5 Second Test - First Impression
Violet color, explore button

Tasks
Question 1 - Login (5/5)

Question 2 - Onboarding (5/5)

Question 3 - Rules for applying to courses (3/5)

Question 4 - Filter and explore courses on Home Page
"both buttons gets clicked in one click" (4/5)

Question 5 - Find example projects for the Advanced Visual Interfaces (5/5)

Question 6 - Check courses a student has taken and read the review of Human-Robot Interaction (4/5)

Question 7 - My Backpack
“tough to get through. Needs to asked to drag in the question or see better information that you can drag the courses!” (2/5)

Question 8 - What’s happening
“Courses added, i see that i seem to have more credits than whats allowed”

Question 9 - Join a discussion in a thread about Robotics.
The question needs rephrasing. (1/5)

Question 10 - Try to access internships (2/5)

Question 11 - Adding a course review (5/5)

Question 12 - Applying (5/5)

3.3. Participant 3

5 Second Test - First Impression
It's about students, I like the colors, very coherent, a good amount of white space didn't read the content, but think there is an explanation of what one can do in the app.

Tasks
Question 1 - Login
The placement of login feels natural. She feels safe to log in through the UU portal.
She likes the name backpack. (5/5)

Question 2 - Onboarding
It was obvious what this was about and very easy. (5/5)

Question 3 - Rules for applying to courses
She found it easily, but it felt more natural to have ‘Rules’ as a separate page in the navigation (4/5)

Question 4 - Filter and explore courses on Home Page
She went to the All courses section. Didn’t notice the AR/VR filter immediately. For her, it was more natural to just start clicking on the courses within this field that were already visible for her in Recommended or All courses. (2.5/5)

Question 5 - Find example projects for Advanced Visual Interfaces
She loves design. It was very easy to find example projects and likes the feature. (5/5)

Question 6 - Check courses a student has taken and read the review of Human-Robot Interaction

She thinks it is very easy to navigate and the placements are logical. (5/5)

Question 7 - My Backpack
It was confusing for her that she had to drag. She didn't read the assistive text that she was supposed to drag. She expected that click would work. Also on mobile, it would be difficult to drag she mentioned. (4/5)

Question 8 - What's happening
She expected the system to already know that she is a fee-paying student and not warn her that she might have extra costs.

She would try to remove it or click on 'Get help"

Question 9 - Join a discussion in a thread about Robotics.
Very straightforward interaction. The page is clear. (5/5)

Question 10 - Try to access internships
If the content is locked she doesn't know what she has to do to get points when she sees the content is locked.

She wanted to use the secondary button from the screen. (4/5)

Question 11 - Adding a course review
The 'Unlock' page is very content and text-heavy. The past contributions do not need to show all the text. She didn't understand what contributions can be. She didn't read the list with contributions for the different parts.

She likes the confirmation toast. (3/5)

Question 12 - Applying
First she wanted to click on courses.
She loves that it takes her directly to Antagning. (5/5)

3.4. Participant 4

5 Second Test - First Impression
"Purple, "By students, for student", 3 sections"

Tasks
Question 1 - Login (5/5)

Question 2 - Onboarding (5/5)

Question 3 - Rules for applying to courses
"Question needs rephrasing" (3/5)

Question 4 - Filter and explore courses on Home Page

“Why did both sections get filled from one click?” (5/5)

Question 5 - Find example projects for Advanced Visual Interfaces (5/5)

Question 6 - Check courses a student has taken and read the review of Human-Robot Interaction (5/5)

Question 7 - My Backpack
“Say to drag in question or something should give this feedback in the app” (3/5)

Question 8 - What’s happening
“I have too many credits”

Question 9 - Join a discussion in a thread about Robotics.
“Question needs rephrasing (2/5)

Question 10 - Try to access internships
Press to contribute (4/5)

Question 11 - Adding a course review
“Couldn't reach what I needed”, it was not intuitive for me how to find internships” (1/5)

Question 12 - Applying (4/5)

3.5. Participant 5

5 Second Test - First Impression
“I saw the logo, what the system is about and a s button” “Backpack is for exploring subjects”

Tasks
Question 1 - Login
“It was easy UI is similar to what I was used to” (5/5)

Question 2 - Onboarding (5/5)

Question 3 - Rules for applying to courses
The participant clicks on ‘how it works’, clicks on ‘rules selection process’. Participants found it easy, but “if it’s very important it should be more evident”. (4/5)

Question 4 - Filter and explore courses on Home Page
Participant clicks ‘VR/AR’, click the filters. He doesn’t understand the filter names of ‘UU Freestanding Courses’ and ‘Courses Outside of UU’. (3/5)

Question 5 - Find example projects for Advanced Visual Interfaces (5/5)

Question 6 - Check courses a student has taken and read the review of Human-Robot Interaction

The participant clicks on the profile picture. He finds the past courses easily but clicks on the Human-Robot Interaction project that is listed instead of 'read review' in past courses. The Participant explains "I got confused where to click, I thought it was under the picture" (3/5)

Question 7 - My Backpack
The participant correctly clicks the Backpack button. "I think backpack is like a wishlist". Participant correctly adds courses a list. (4/5)

Question 8 - What's happening
"I want remove a course but I cannot do it" "I didn't see the warning first time". He would like to redo/go back.

Question 9 - Join a discussion in a thread about Robotics.
Participant does task correctly. (4/5) [moderator asks what he can see here and what he could do] "I can talk to people about courses." "I was searching for a list of courses in the community where I can talk about."

Question 10 - Try to access internships
Participant understands that he needs to contribute. But got confused by jobs and internships and the unlock and what he should do. Participant doesn't understand what he must do to unlock. Doesn't get it the ticks and crosses at first. (2/5)

Question 11 - Adding a course review
Participant properly adds a contribution. He goes back home, clicks contribute again and submits another contribution. Clicks backpack and clicks profile [went home]. He found it difficult and didn't understand that he should click internship. He thought these were tags. "it was hard" (4/5)

Question 12 - Applying (5/5) [completed after question 8]

General comments at the end of the session

- The contributions page has so much information
- The type of contributions was inclear
- The filters UU and outside UU are unclear
- I like the 'my backpack'
- I cannot remove a course when I make a list
- Participant thinks backpack is a wish list and the course list is a card [schedule]
- There is no button to add axtra course lists after creatng the first one.
- Some pages are too cluttered

3.6. Participant 6

5 Second Test - First Impression
"Some text a CTA button between. I didn't remember anything specific."

Tasks
Question 1 - Login (5/5)

Question 2 - Onboarding (5/5)

Question 3 - Rules for applying to courses
The participant clicks ‘how it works’. Reads how to use the application reads about the application, and then click the rules. “It is pretty clear explaining how it works, but the ‘rules selection process’ may be a bit confusing, a bit misleading. wasn't sure if this is what I was supposed to look for” [naming of the tab]

Question 4 - Filter and explore courses on Home Page (5/5)

Question 5 - Find example projects for Advanced Visual Interfaces (5/5)

Question 6 - Check courses a student has taken and read the review of Human-Robot Interaction
Participant instantly clicks review. He mentions that it helps that the name was highlighted. (5/5)

Question 7 - My Backpack
The first thing that the participant wanted to do was to go to the first page, but then noticed that there is a button. “but I’m in review so am I adding a review or add a course?”

Question 8 - What’s happening
The participant understands that he is exceeding the maximum number of credits. He sees the message that he can get help, but mentions it is a problem for fee-paying students.

Participant refers to the favorites part as “these are programs or fields of interests...a summary of what I’m interested in”. The course list is what courses he wants to take and see if the schedule will work out. When asked if he would like extra lists, he says “if you can compare different lists yes other than that maybe no”.

Question 9 - Join a discussion in a thread about Robotics. (5/5)

Question 10 - Try to access internships
He clicks internships but it is locked, so he clicks unlock. “I initially thought the contributions page was a subscription page”. Then reads what he needs to do to unlock internships.

Question 11 - Adding a course review
At first the participant goes back to the home page and tries to search HCI course. He seems lost. Moderator directs the participant to go back to the contributions page, now he understands. He explains that he was biased because he initially thought it was a subscription page. “the word ‘contribution’ might have been misleading.” “The add contribution/survey looked kinda greyed out so I didn't really pay attention to it so I tried to explore the prototype”. The participant found it confusing that he should click on the internship as he explains that if he hadn’t hovered his mouse over it he wouldn’t have known it was clickable. “I found this a bit misleading”.

Question 12 - Applying [completed after question 8]
The participant thinks clicking apply will redirect him to University Admissions or Antagning, where he can login and apply to the courses he selected.

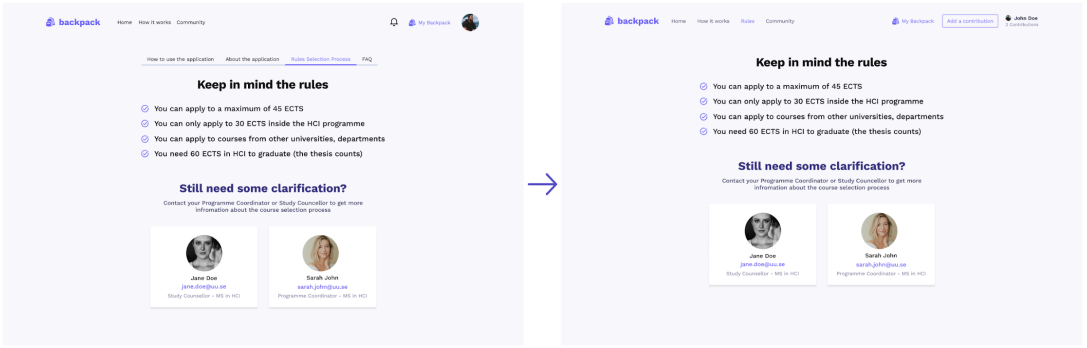
General comments at the end of the session

- I loves the idea. it looks good.
- A suggestion. it reminds me of the same structure of the systems that currently exist and they have so much information and maybe he doesn't have much time to view all of it.
- The last part [contribute] was a bit confusing
- I like ‘my backpack’ it refers to your experience and a shopping cart
- Maybe in backpack, add some more description.
- The internship thing I wouldn't have gotten it if I hadn’t hovered over it - it was not clear.

Appendix H - Design Improvements

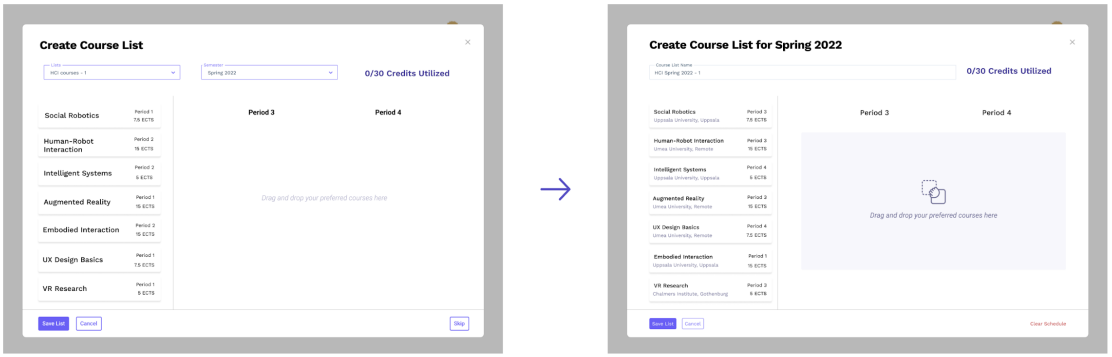
Below we showcase the changes that were made to the design based on the most critical issues found during the usability tests.

1. The test showed us that the users cannot find the rules of the selection process easy while this as mentioned before is a very crucial feature and should therefore be easy to find. We improved this by adding the rules as a separate tab in the navigation and making sure it is highlighted where the user is.



Old Design | Updated Design

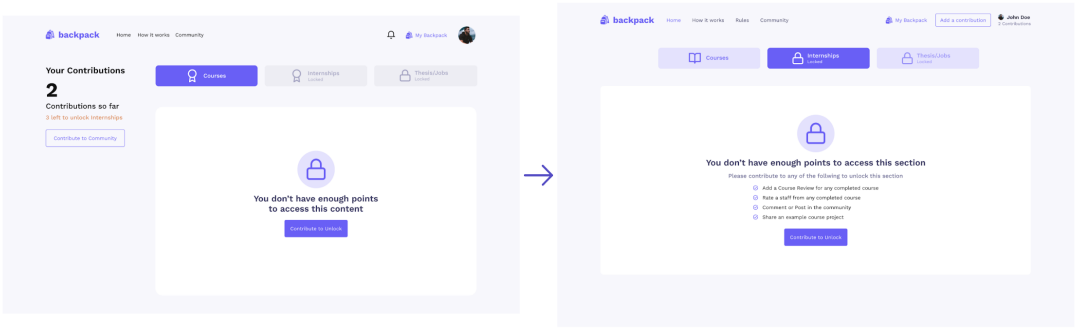
2. While a user makes a course list we showed some assistive text indicating that they could drag a course in the field. Unfortunately, this was not visible enough for most users. In the improved version, we made sure it is clear that users have to drag and drop courses.



Old Design | Updated Design

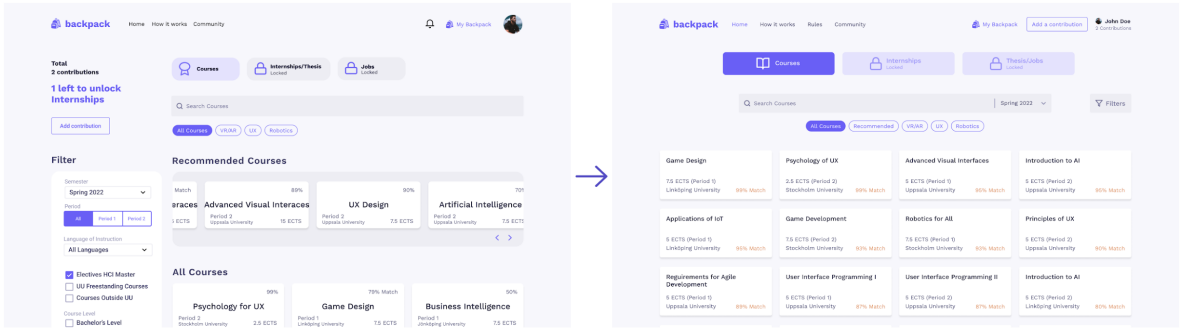
3. Several users indicated that they didn't understand what they had to do to access locked content. Now we have made sure it is clear what users need to do to unlock

sections ‘Internships’ and ‘Thesis/Jobs



Old Design Updated Design

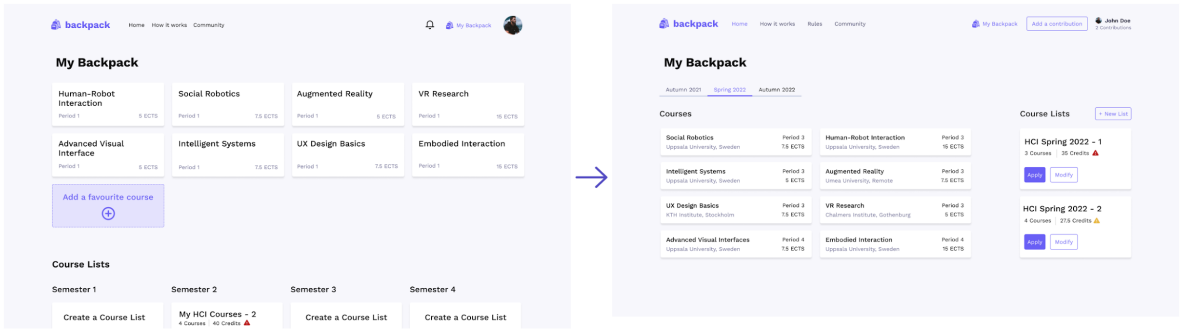
4. We have made ‘Add contribution’ a more central component of the page so that it is more visible.



Old Design Updated Design

5. Moreover, we have improved the Courses, Internships/Thesis, and Jobs navigation to clearly show which ones are accessible and which ones are not. We also made sure it now looks clickable.

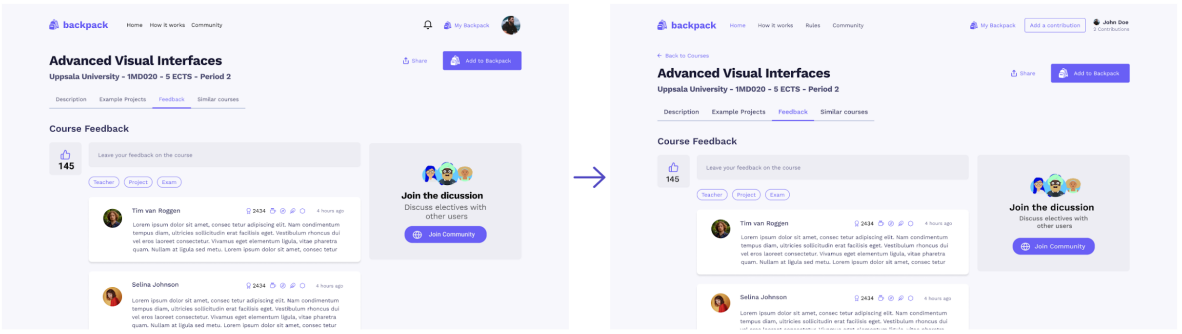
6. After a comment from one of the users, we realized that when someone adds a lot of courses to his/her backpack, the course list will shift down; making it only visible if the user scrolls down on the page. As shown on the right image, we make sure the course lists always stay above the fold. Besides, we divided the added courses based on semester so that the user doesn’t have to look at each course to find this information.



Old Design Updated Design

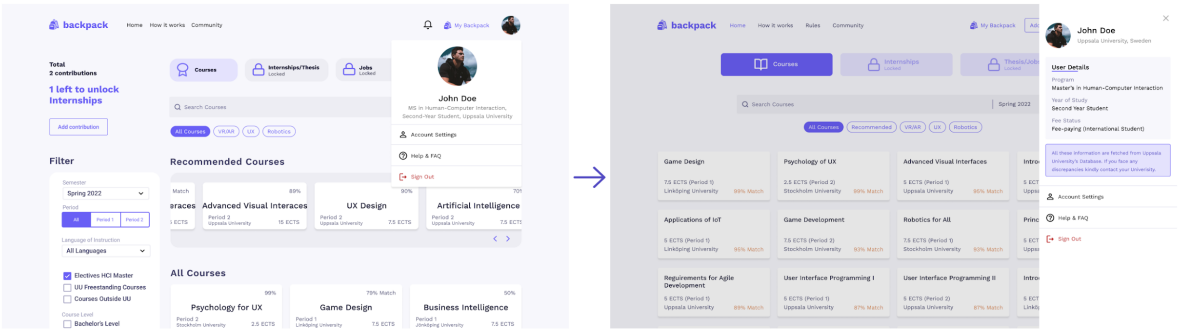
7. Some users indicated that they didn't know where they were because the navigation bar doesn't highlight the location. We improved this in the next version. Additionally,

we adding breadcrumbs or navigation links to help users show where they are and how to get back to where they navigated from.



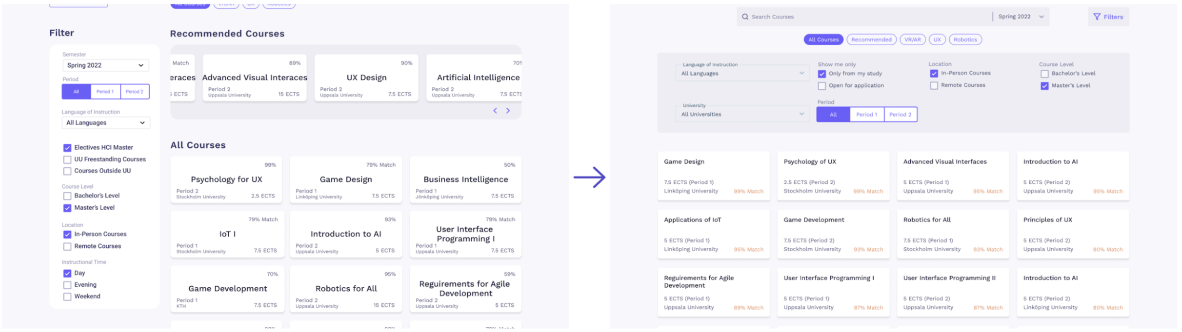
Old Design Updated Design

8. When logging in with the Uppsala website we are fetching information about the user. This information such as 'fee-paying student' should be visible in a sliding component for user profile and user settings. This will make the user aware of what information the system has on them.



Old Design Updated Design

9. Lastly, we have improved the filtering on the home page.



Old Design Updated Design

Appendix I - Heuristics Report

Heuristics Evaluation Report

Heuristics Testing - Backpack Prototype

Test Date: October 26, 2021
Report Date: October 26, 2021

Heuristics	Rating	Notes
Visibility of system status	**4**	**Positive:** We have some screens in which we show the system status. For example: - Locked Content Screen: We have sections that can be accessed only after contributing to the community. In such cases, we will tell them why they cannot access that section and what you should do in order to unlock it. - Pop-ups about credit limit in course list creation screen: We show the user how many credits they are utilizing while creating course lists and if they are exceeding their credit limit we warn them immediately about what might happen due to this. **Negative:** - We have very few places in which we show a user's progress. Hence this is not enough to evaluate this heuristic properly.
Match between system and the real world	**4**	**Positive:** - We are using the same vocabulary and content a student is used to when it comes to course selection. - The name of the application is a backpack, which is a concept that was demonstrated to be self-explanatory during the usability testing sessions. It helped students to know how the application works. **Negative:** - We are building an application for International students coming from various linguistic backgrounds. Currently, the entire UI is based in English, and to make it localized we have future plans to show the UI in multiple languages.

User control and freedom	**4**	**Positive:** - Users always have the option to navigate back and forth in the application. - Users can modify or delete a list of courses created by them. **Negative:** - Users can include and remove easily courses from their backpack
Consistency and standards	**5**	**Positive:** - The design language and style guide was finalized before we started working on the UI design. All these styles and components were reused to bring in a consistent appearance and experience while interacting with the UI. - The same vocabulary has been used throughout the application for them to understand the context well.
Error prevention	**4**	**Positive:** - In the schedule manager, we do not allow a user to drag a course in a period in which this course is not taught. - If a user exceeds the ECTS credit limit we warn the users what might happen due to these surplus credits.
Recognition rather than recall	**5**	**Positive:** - Users have a navigation bar on top of the screen to know which part of the application they are in. They do not need to remember how to track back and navigate, they can just use the backlinks provided or navigate through the links in the top navigation bar. - Based on the user's areas of interest we recommended courses with a percentage (%) match which can easily remind the users about other existing options which they can consider or look at.
Flexibility and efficiency of use	**N/A**	**Not applicable:** - This is a web application with simple and direct user action needed in order to achieve

		the goal. We don't support any system shortcuts to ease this process. So this heuristic is not relevant to us.
Aesthetic and minimalist design	**5**	**Positive:** - We have used a minimal color palette that tries to give a positive experience when a user interacts with the UI. - We have designed the user interface with sufficient whitespace, legible typography, beautiful icons and have used the right colors which makes the UI look aesthetic.
Help users recognize, diagnose, and recover from errors	**5**	**Positive:** - In the schedule manager, when the users try to add more courses to the list and exceed the credit limit than one has, an alert shows up. This alert gives the option of asking for help and telling exactly what the problem is.
Help and documentation	**5**	**Positive:** - Users can access sections like "How it works", and "Rules" using the Navbar at the top within any section of the application. Both these sections provide information about how to use the application, how the process works etc in some simple steps. - FAQs have been added to address common doubts students might have regarding a course selection process. - Each course page consists of important contacts a student might need in order to know more about the courses.
Overall Average	**4.67**	

Ratings: 5 Excellent 4 Good 3 Acceptable 2 Poor 1 Bad

References

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Nielsen, J., & Budiu, R. (2001, February 17). Success Rate: The Simplest Usability Metric. Nielsen Norman Group. Retrieved October, 2021, from https://www.nngroup.com/articles/success-rate-the-simplest-usability-metric/

Nielsen, J. (1994, April 24). 10 Usability Heuristics for User Interface Design. Nielsen Norman Group. Retrieved October, 2021, from https://www.nngroup.com/articles/ten-usability-heuristics/

Appendix J - Consent Forms

Appendix J.1 - Consent Form for Focus Group

Focus Group Consent Form

Purpose
This is a research study conducted as a part of the HCI course project. You have been invited to take part in this study as a first-year HCI student at Uppsala University. The purpose of this focus group is to determine students' current course elective selection process. The information from this study will help us to improve students' decisions regarding selecting the right electives and increase their satisfaction with their program.

Procedure
During this study, you will be discussing questions in a small group. The moderator will be responsible for facilitating the sessions and asking questions to guide the discussion. With this study, we would like to discover the many viewpoints on the research subject and therefore there are no right or wrong answers. We want every participant to voice their thoughts and we kindly ask you not to interrupt other participants when they are speaking. Yet, you are free and even encouraged to honestly oppose another participant's response if you don't agree with their statement afterward. However, at all times please follow the instructions given by the moderator.

Confidentiality
This session will be recorded and an observer will be present to take notes, to ensure the accuracy of the results. However, your responses will be anonymized and all personal data will remain confidential. The final paper shall not include any names or other data that could be traced back to you. The data will be stored securely and access will be restricted to team members. The data will only be used for research purposes and all personal data will be removed at the end of the study in accordance with Article 17 §1.a of the GDPR (i.e., Right to Erasure). As a participant of this study, you are free to opt-out at any moment and/or have your data removed from being used in the study.

When you choose to participate, please respect the privacy of the other participants in this focus group by not disclosing any confidential and personal information that is discussed during the session.

Contact
If you have further questions, concerns, or would like to have your data removed from the study, please contact:

Lauren van Loo
lauren-valentine-maria.van-loo.1548@student.uu.se

I hereby declare that I understand the given information and agree to participate in the study

Name: _____ Date: _____

Signature:

Appendix J.2 - Consent Form for Interviews

Interview Consent Form

Purpose
This is a research study conducted as a part of the HCI course project. You have been invited to take part in this study as part of the university staff at Uppsala University. The purpose of this interview is to hear the perspective of the university staff on the current selection process of elective courses. The information from this study will help us to improve students' decisions regarding selecting the right electives and increase their satisfaction with their program.

Procedure
During this study, you will take part in an interview, answering and discussing some questions. The moderator will be responsible for facilitating the session and asking the questions. With this study, we would like to discover the many viewpoints on the research subject and therefore there are no right or wrong answers.

Confidentiality
This session will be recorded and an observer will be present to take notes, to ensure the accuracy of the results. However, your responses will be anonymized and all personal data will remain confidential. The final paper shall not include any names or other data that could be traced back to you. The data will be stored securely and access will be restricted to team members. The data will only be used for research purposes and all personal data will be removed at the end of the study in accordance with Article 17 §1.a of the GDPR (i.e., Right to Erasure). As a participant of this study, you are free to opt-out at any moment and/or have your data removed from being used in the study.

When you choose to participate, please respect the privacy of the other participants in this focus group by not disclosing any confidential and personal information that is discussed during the session.

Contact
If you have further questions, concerns, or would like to have your data removed from the study, please contact:

Josef Jönsson
josef.jonsson.0481@student.uu.se

I hereby declare that I understand the given information and agree to participate in the study

Name: _____ Date: _____

Signature:

Appendix J.3 - Consent Form Survey

Purpose of this study
This is a research study conducted as a part of our HCI course project. You are being asked to take part in this study because it deals with how we can help students select the right electives and increase their satisfaction with their programs and we have chosen the students of the Masters in HCI program as the target audience to conduct our research. For this study, we are doing a survey to understand more about our research problem.

What will happen if I take part in this study?
If you agree to be in this study, you will complete this survey online. The survey asks questions about the elective selection process in general, your selection strategy, the importance of elective selection, etc. It will take you about 10 minutes to complete the survey.

How will my information be used?
We will use your information to guide our study. Information gathered in this survey will only be used for this study. It will not be shared elsewhere and your identities will be anonymised.

Where and how safely will this data be stored?
We will be using Google Workspace products like Forms and Spreadsheets to collect, store and analyse the data. Access to the collected data will be restricted to the team members and will be used only for the research purposes.

Can I opt out this research at any time?
Yes, you have complete autonomy of taking part in this research activity. You can choose to leave this study whenever you feel so. If you want your data to be deleted at any point of time during this research please contact

Karthik Venkataraman Meenaakshisundaram
karthik-venkataraman.meenaakshisundaram.0233@student.uu.se

Consent to participate in our research
To comply with the research ethics and the privacy regulations of the European Union, we'll need you to provide consent before taking part in this survey and to share your data for our research purpose.

I consent to participate in the research activities for this project and allow my data to be used for research purposes.

- ☐ Yes
- ☐ No