Evaluating University course search
- development of a new user-centred interface concept

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Abstract

Findwise is a Europe-wide producer of search solutions. One of their search solutions included a university course search interface, which needed revision due to a loss of coherence in the structure. This had negative impact on the simplicity and usability. The thesis describes a process for improving the interface design and user-friendliness of the course search. The search interface previously developed by Findwise have been studied and evaluated in order to develop and bring forward a proposal for a new interface design mock-up. In addition to this, two areas have been explored in more detail; search engines and Human computer interaction methods.

The resulting proposal consist of usable methods for structuring course search interfaces, creating a more intuitive new design.
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Chapter 1
Introduction

This bachelor thesis was conducted at Findwise in Stockholm, Sweden.

Findwise is a consulting company working exclusively with search and findability. They help to choose, design, implement, customise and govern any type of search driven solution (www.findwise.com/about-us). Since 2010 they have been working with a search solution for Uppsala University (UU).

UU is one of the largest universities in Sweden and offers a wide range of courses. The current university search solution, developed by Findwise, includes some different categories and filters to help the students find the information they want. The interface of the search solutions has never been evaluated from a usability perspective, which is important when ensuring that the user needs are met. This study will evaluate one part of UU's search solution, namely the course search.

One of the information needs for UU students is to find information about the available courses at the university. A student may use different ways to find information. The needs for students differ depending on the situation they are in. A foreign student who looks for available classes at the university may have different needs than a first year student who want to find an elective course for next term. Other students might need to get some extra credits and want to find a course in late semester.

- To sum up - different students require different things, they have different needs.

One important point for communicating the information available on a university website is having a usable interface.

Currently there is a standard search solution on UU, which is not adjusted to fit the students. That may be one of the reasons why students do not use the search engine when they search for courses. The students will benefit from a working internal search solution, which can meet the student needs and it would not be as a general search like Google, which only shows the most searched results.

How can the available information and choices be presented in a user friendly way? How should info be found, and how to communicate it? How may the search results be presented in a good way?

The evaluation will be in terms of Human Computer Interaction (HCI) and usability, and result in development of a new more user-centred interface concept. The methods used in this study are presented in the second chapter.

The main purpose of this thesis is to investigate, with the help of user testing for instance via observation, how students behave while using a course search, and furthermore what they think and prefer. Opinions from users of UU’s current search solution will be collected to see what users want, and thereby get some directions on how to design an interface. Another purpose is, based on the result of that study, to develop an interface concept suited to mediate the design qualities of search user interfaces.
The idea is to improve information search with the help of user testing, HCI theories and guidelines for search. Adapting a user-centred approach in the design process is another step further for producing interfaces that add values to its users.

The current UU search interface will not be described in detail since it is a standard solution. Areas of interest in this study are the methods chosen to evaluate UU with. The current interface is being used only as a kind of starting point to start with before the development of new design.
Chapter 2
Theory of Search Engines & Interaction Design

This section explains the background of interaction design, its aim and how it focus on users. The section will also deal with search engines. A brief literature study was made on interaction design and search engines, how they work and how they are combined, and it is presented in this section. All the methods listed below are used in the study. It is a description of the methods applied to solve the problem.

2.1 What is a web search engine
There are three main aspects of how a search engine works: spider, indexer and index. Search engines work by sending out a spider (web crawler), which crawls the web to fetch as many documents as possible. In the next step a program, called an indexer, reads the documents and then, on the basis of the words contained in each document, builds an index.

All search engines use proprietary algorithms to create the index, which ideally only returns relevant results for each query (Sarr, 2004).

The engine also uses a search module, which searches the index. The search module searches the engine's index and not on the Internet itself.

The interface can be a search browsing solution. Browsing is about following a series of links and select operations and refers to selecting links or categories that show pre-defined information (Hearst, 2009).

2.2 How to use a search engine
The interface conveys the input and output. The well-known search box, is the iconic symbol of search. It works by simply typing in one word or more, and you are ready to perform a search. The process of search contains two primary steps, to type in a query and then a list of search results is presented and you get to choose the best fitted hit.

2.3 Text processing
To process the text during search there are some methods that can be used to avoid common errors.

**Synonyms:** It is useful to have suggestions for terms that can be searched, like the common things people are searching for. A synonym dictionary can be created to help the search process. It lets the search engine redirect searches on synonyms of various kinds, even on common misspellings - to the correct concepts.

**Stop-words:** To make the searching process easier for the user, the search engine should process the text in a beneficial way. There are a lot of meaningless words, called stop-words, examples from English are; and, are, the, and more. These words are meaningless
to search because they exist in all documents. A list of stop-words can be used, in which these words are filtered out when indexing (Hearst, 2009).

**Endings:** The search engine should also be able to manage endings. If the user types in a word like school, the search engine should also search for school, schools, and etcetera.

**Meta tags:** Short and concise summaries, meta tags, of the document should be presented to users. Notice that an editor could do it much better than the auto-generated summaries by a machine. Summaries of the meta-tags are available in the HTML head (Croft, 1997).

### 2.4 Design patterns used as solutions to common problems

UU use some design patterns for search engines and some of the most common ones are presented below:

- **Autocomplete:** When a user types something in the search box, suggestions will be shown automatically. An example of autocomplete is shown in figure 2.1 showing automatic suggestions while typing.

![Autocomplete Example](image)

**Figure 2-1:** what autocomplete could look like. A picture of the current start page of the search solution of UU’s website.

- **Best first,** works by determine the hits you want to appear first on the list of results. It is shown that the first three results will receive most of the attention. Some algorithms that are used to help select those hits are relevance, popularity, and date. It can also be uniquely created using the search history, location and other input that might influence the results (Callender, 2010).

- **Faceted navigation,** which could be described as different categories in the solution to help filtering and specify the search results (Callender, 2010). Users can easily understand them.

- **Personalization,** meaning that the users search history, or as an example current location might influence the order the results are presented in (Callender, 2010).
2.5 Interaction design

“Interaction can be defined as designing interactive products to support the way people communicate and interact in their daily lives and work” (Helen Sharp, 2007)

Interaction design is about much more than just Human-Computer Interaction (HCI). An interaction designer needs mixed skills from psychology, HCI, web design, computer science, information systems, marketing and more. Interaction design is about understanding of the capabilities and desires of people as well as using technology to communicate and evolving them into design that suit the user needs.

To get a clue what interaction design is about, the interaction process could be summarised as four basic activities.

1. Identify needs and requirements of the user
2. Develop alternative designs
3. Build interactive versions of the design
4. Evaluate the design throughout the process and the user experience (Helen Sharp, 2007).

All of these activities were applied in the study.

2.6 User oriented design methods

The user experience is about how people feel when using a product, and the user satisfaction and pleasure looking at it, holding it, etcetera (Helen Sharp, 2007).

The Design process

There are many methods to get creative work started, and one of the most well known is the design process. In turn, there are different versions of the process, and this is one of them.

Within interaction design there are four basic activities; identifying needs and establishing requirements, developing alternative designs, building interactive versions of the designs, and evaluating the designs. These four activities are the cornerstones of most design processes, some consist only of these, while others have been extended with various subtasks (Helen Sharp, 2007). A simple design model is shown in Figure 2.2.
Figure 2-2: A simple design model of interaction design.

Iteration is an important part of the design process. When the stages are traversed repeatedly more weaknesses can be found and good design emerges from iterations (Helen Sharp, 2007).

The four cornerstones are described below.

**Identify needs and establish requirements**

To identify needs, the designer has to know who the users are and what they need from the product to be designed. The design that is being developed should support the user in different situations and it is important that correct type of support is provided in the interactive product. The identified needs may then be the basis for product specifications, where all the requirements that the product must fulfil are listed (Helen Sharp, 2007).

**Developing alternative designs**

The requirements must be met to achieve a good design. During this step the main design work and ideas is generated in order to reach the requirements. This activity can consist of a conceptual design phase. The conceptual design includes how the product works, how it should behave and look like.

**Building interactive versions of the designs**

This activity means that a design version is created, which can be tested on users through interaction. There are several types of interactive design options, ranging from a complete program to "Lo-fidelity" prototypes. Lo-fidelity means simple paper prototypes and sketches. This is preferable early in the design process, to test the interaction and in an inexpensive way test design ideas. These simple prototypes also give the user more space for criticism of the design and point out errors. Later in the design process, it is preferable to create a complete program for user testing.

When it comes to prototyping, there are two different types of prototypes, low fidelity (low-fi) prototyping such as paper-based and high-fidelity (hi-fi) prototypes. Low-fi prototypes are easily produced and quick modified and they are advantageously used in the early stages of design, but it does not look very much like the final product. Hi-fi prototypes look much like the final product. It takes long time to produce, as the prototypes often are built in software, which might set the expectations too high (Helen Sharp,
Users tend to give more comments and suggest changes to a low-fi prototype, than a prototype that looks like the final product (Hearst, 2009).

**Evaluate designs**

The last step is to evaluate the design, and it is first of all important to determine how user friendly it is, which can be measured in several ways. Examples of measurement techniques can be user tests where the numbers of errors users make counts, how well the design meets the requirements set or how inviting the design is. Involving users in evaluation increases the chance that the end product will be good and user friendly (Helen Sharp, 2007).

**Contextual investigation**

Combining interview and observation is called a contextual investigation (Finn Wiedersheim-Paul, 2006). To get to know what the user really thinks during an observation, the think-aloud method can be used. It works simply as it sounds, the user tells what is going on in her head, what she is thinking of (Helen Sharp, 2007). While recording observations it is preferable to use a structure, for example:

- Actors, the persons or subjects.
- Activities, what are they doing and why?
- Acts, what are the specific individual actions?
- Time, what is the sequence of events?
- Goals, what are the actors trying to accomplish?
- Feelings, what is the mood of the individuals? (Norman, 2002), (Helen Sharp, 2007)

According to a previous study performed by Nielsen, five users is an acceptable number to be tested to gain enough information about a certain user group. You can find almost as many usability problems as you would find using many more test participants (Nielsen J., 2000), (Hearst, 2009), (Helen Sharp, 2007).

**Norman’s design principles**

Donald A. Norman has developed various design principles that should be considered in the design of an interactive interface. These principles are central to all interaction and should always provide the base for interactive interfaces. The most common principles are noted below (Norman, 2002), (Helen Sharp, 2007).

- Affordance: Affordance accounts for the actual properties of an object, the primary fundamental characteristics that determine how an object may be used. One example of affordance is a button that invites the user to press it. Affordance gives strong clues of how an object should be used, like doorknobs are supposed to be turned. When affordance is utilised the users understand what to do just by looking at the object. No instructions, images or markings needed.
- Constraints: This design concept determines ways of restricting the different kinds of user interaction that can take place at the same time. Constraints limit what can be done, it limits the number of alternatives.
- Visibility: This principle is concerned of making the relevant and important features of the products design visible. By displaying the functions, it may increase the pro-
spect that users choose the right options and understand what to do. The placement of buttons and controls is of importance so that the link between function and action becomes clear.

- **Mapping**: Mapping is a technical term referring to the relationship between two things. The relationship between controls and their effects in the world.

- **Feedback**: Feedback is a link between inputs and outputs. This link will provide every operation and action an immediate and obvious effect, i.e. send back the information of the type of action, and what has been achieved. This allows a person to understand the design and learn the result of an act. The concept is strongly linked to the principle of "making things visible" and by using feedback in a good way we can also create visibility. There are many different types of feedback such as auditory, tactile, verbal, visual, and various combinations of these. Good designs should use one or a combination that is best suited for the actions concerned.

- **Consistency**: This concept is about following rules and to be consistent. An interface should use similar operations and elements to perform similar acts. In this way the user can learn and feel safe in that a known button has the same function regardless of where in the interface it is found. A difficulty in designing an interface may be to determine if the functions and objects are to be consistent with the physical world or with the computer-based world.

**Scenarios**

"Scenarios are informal stories about user tasks and activities" (Helen Sharp, 2007)

Scenarios are about creating possible user series of actions and events (Helen Sharp, 2007). Scenarios can be used to evaluate models and identifying possible user trouble.

**2.7 Evaluation of user search interfaces from a usability perspective**

One method to help evaluate search interfaces from a usability perspective is by using ISO 9241-11. There are three main aspects of usability:

- **Effectiveness**, or power, describes how much of a goal or task that is achieved.
- **Efficiency**, the effort required to achieve the goal. Less effort means better efficiency.
- **Satisfaction** is the degree of positive feelings that the product generates.

According to the book “search user interfaces” these are the criterias to focus on during an evaluation of search user interfaces. This perspective is kept in mind when the interface is created (Hearst, 2009).
There are also some guidelines that are preferable to follow, called seven guidelines for search (Hearst, 2009)

1. Offer efficient & informative feedback
2. Balance user control with automated actions
3. Reduce short-term memory load
4. Provide shortcuts
5. Reduce errors
6. Recognise the importance of small details
7. Recognise the importance of aesthetics

**User Interaction Satisfaction Questionnaire**
To get the overall attitude of a design, a user interaction satisfaction questionnaire could be used. A commonly used method called Likert scale could be an appropriate tool for identifying responses to a question, the response could later be compared across the participating respondents. The Likert scale is helpful when creating surveys and interviews. They are used for measuring user's opinions, attitudes and beliefs. The scale is also helpful while evaluating user satisfaction with interfaces and products. The scale is composed of a set of statements and a range of possible responses the users can choose from (Helen Sharp, 2007).

The questionnaire is meant to complement the observation and can be built using simple arguments. It is quite open in choosing which way how to do it, just use simple words or statements. The user can chose if they agree or disagree with the statements.

**Chapter 3**
**Methods and User Tests**

The idea of performing a user test is to try to understand how the target group functions, and what their needs are. In order to understand them it is also important to see how a typical user, in this case a student, uses the search service.

In order to collect ideas and information about the new design, a user study was conducted. The study included five phases; applying Normans design principles to the current interface, performing a short interview, observation, a user interaction satisfaction questionnaire, and finally have an open discussion about search engines in general.
The requirements of user-centred design can be tested by applying Norman’s six selected design principles. Thus a hypothesis can be formulated before the user test is performed (Norman, 2002).

Below in Figure 3.1, the current Interface of UU’s search solution is shown.

After applying Normans design principles, the user test was prepared. First the user group was specified; the chosen group was students in a program at a Swedish university.

The user test contained four steps; interview, observation, user interaction satisfaction questionnaire, and an open discussion. Five user tests were performed using the current search interface. Preparations for the user test included creating relevant interview questions, deciding which search scenario was thought to give most information about how the students behave, what they need, and if something was difficult. Finally twelve statements were formed to the User-Interaction Questionnaire, and then the statements printed on paper for the users to mark their reply. The statements are inspired by an article and a book (Lewis, 2009), (Helen Sharp, 2007).

The open discussion was unstructured with questions like what the users prefer, and what they think about their university search engine.

The user tests were tested by performing a pilot study. The whole user test setup was tested in a pilot study, where my supervisor at Findwise was used as a test person to investigate whether the interview and the observation scenario were suitable or had to be changed.
When the pilot test was performed, the setup was modified a bit. One issue that was identified in the pilot was the importance of explaining to the user what the observation is about, and to tell the users that there is no right or wrong way, because the users are the experts and the tester will learn from them.

3.1 Method User test

The four steps of the user test were:

1. Interview
The interview consisted of a few questions about the students situation, which program they are in, and if they had any previous experience from search engines. All the questions are listed below in Figure 3.2 (in Swedish):

```
Intervju innan
Ålder:
Utbildning:
Universitet:
Hur länge har du pluggat på universitet:
Sök
Har du använt sökfunktionen på ditt universitet?
Minns du vad du sökte?
Hur gick det?
Använder du någon sökfunktion dagligen?
Använder du någon annan (sökfunktion) också?
```

*Figure 3-2: Figure of the questions of the small interview.*

2. Observation
During the observation the previously created user scenario was used, it was about to find a course in the participants’ program area, 7,5 student credits, during autumn term 2012, at 100% pace of study. This user scenario was thought to gain the most information about users' behaviour.
If the student could not think of a course or area to search for I said things to get them to think about something.

The scenario that the participants performed was meant to capture how the student function, but also possible hidden problems within the solution. One extra scenario was prepared, just in case if the participant could not come up with a search query. If the first attempt gave bad page response, they could refine the search by using more words. After about two attempts in getting ways to refine their search, it became difficult to think of new keywords.

Another method, the “Think-aloud” technique was applied to evaluate what the user really thinks during the observation. As mentioned earlier the user tells what is going on in her head, what she is thinking of (Helen Sharp, 2007).

To get as much as possible of observation, there were a few pre-focus points to concentrate on during the observation. The focus of the observation was:

- **Actors**, the person. This was covered with the interview.
- **Activities**, doing the scenario, how the student behave while performing the scenario.
- **Acts**, individual actions for each user.
- **Time**, to make the given scenario, checked the overall time to perform the scenario.
- **Goals**, the goal of the scenario is when the student find a course in their area of interest.
- **Feelings**, the mood of the individuals when they are being observed. (Helen Sharp, 2007)

During the observation the three points acts, goals and feelings were actively checked. The other three were checked before the observation started.

3. **User interaction satisfaction questionnaire**

A questionnaire including twelve statements is another part of the user test, it is applied as a method to evaluate search user interfaces. To evaluate the questionnaire in this study, ISO 9241-11 is used. The questionnaire was coupled to ISO's three aspects as a method for evaluating whether it is usable (Hearst, 2009). Only nine of the twelve statements were evaluated, this because they were the only one that had something to do with the three ISO aspects.

Below is ISO 9241-11 three main aspects of usability presented, for each aspect three statements from the UI-satisfaction questionnaire is fitted.

- **Effectiveness**: I get what I expect when I click on objects on the site, I find this site useful, I feel in control when I am using this site.
- **Efficiency**: Everything on this site is easy to understand, this site needs more introductory explanations, I feel efficient when using this site.
- **Satisfaction**: Confusing, Frustrating, Overall I'm quite satisfied with this site.

To get an overall response from the users, all the responses were compared where it was marked on the scale. Statements where three of the users had selected the same answer, were assumed to be the majority way of thinking. With these methods each statement has been evaluated and checked where the majority of users marked the line, and in this way
one got to see if users agree or disagree. Some of the statements are shown below in Figure 3.3, the whole questionnaire is found in the appendix.

<table>
<thead>
<tr>
<th>Statement</th>
<th>Strongly disagree</th>
<th>Strongly agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>6. I feel in control when I am using this site.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. This site needs more introductory explanations.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. I find this site useful.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Figure 3-3: Showing three of the twelve statements in the User Satisfaction interaction questionnaire.*

4. **Open discussion**

An open discussion was held with each user to try to find what they prefer, positive and negative aspects when using search functions. The questions could be as the following.

- What is good / bad in the search solutions?
- Have you had problems before?
- What information would students like to have, how should/could course information be presented?

**Chapter 4**

**Results of the User Study**

The user tests show that there are problems on the existing search interface of UU. This section presents the findings from the user test.

Results from the evaluation with Norman's design principles of the existing search interface showed that the current interface is complex with too many actions at the same time. There are also too many choices (few constraints) to make for the users and too much information is presented at the same time. According to Norman’s principle of consistency, a solution should not be shifting functions and feedback, it is confusing to the users.

The existing search solution uses good techniques but it fails to be communicated to the user because the interface is too cluttered.

It is great that the search has autocomplete and synonyms that provides keyword suggestions, this help the user to get on the right track in choosing words.

The participants of the studies are referred to as U1, U2 and so on. There were five participants in the user test performed on the current search solution. Test person 1 is called U1, Test person 2 is called U2, Test person 3 is called U3, Test person 4 is called U4, and Test person 5 is called U5.
4.1 Results from the interview

The students are in the age-range 23-26 years old, all studying in a program but in different areas, and all participants use Google daily. The subjects are familiar Internet users.

4.2 Results from the observation:
All participants began by typing a word in the search box, all participants chose to start with a relatively general word of the subject in question. Below are some of the user responses.

U1 was frustrated and did not find the category for education, and did not manage to filter the search result. U1 was about to give up, when I ended the observation.

U2 felt frustrated, and at the same time eager to find solutions fast. U2 was impatient and gave negative comments when it did not work. U2 tested many different ways to find a solution.

U3 tried many different ways to try to find the goal of the scenario.

U4 was eager to find solutions fast. U4 looked around on the webpage and found the facets quickly on the left side, commented that it makes sense that they are placed there. U4 was impatient and wanted something to happen directly and tried several solutions in trying to find a relevant course.

U5 was calm, went through different ways to try to find solution to the problem. U5 was close to finding a course in the area of interest, but found only courses with too many student credits.

Although there were courses available at the university, no student managed to achieve the goal of finding a student course in their area of interest, 7,5 student credits, 100 % tempo during autumn term 2012.

At the observations four of five users found the facets and categories and used them to filter the search results, but the students felt that it was not sufficient to get manageable search results.

4.3 Results of the UI satisfaction questionnaire

The users average answers of the questionnaire shows that the users do not feel effective, nor efficient using the search solution, and they are not satisfied with the solution.

In figure 4.1 a small part of the evaluated questionnaire is shown, to get a better overview of how the form was evaluated.
4.4 Results from the open discussion

Some relevant comments from the open discussion was:

- The category choices (facets) should somehow be linked together with the search box to show more clearly that it is possible to filter the search hits.

- The overview must be better, to understand what the user chosen. A better overview of the information, to be able to see the available courses and search results.

- Better contrast to get a hint where to focus.

- Some kind of history to help the user’s remember what activity and choices that they done.

- Feedback is important, if one make a decision one should somehow get feedback of the action.

The ideas and inspiration for a new interface were generated from the user tests and interviews.

4.5 Conclusion of the user tests

Students find it valuable to get an overview of the application. It is preferable to have special focus on some of the aspects that are found, which works as foundation for the new design.

A student’s comments from the open discussion: I cannot sort the result to obtain overview.

The categories below the search box, all, people, education, etcetera, are not visible enough when placed below the search box, according to the users. There is nothing to focus on and everything melts together. Figure 4.2 shows one part of the interface on UU.
Figure 4-2: UU’s interface, the search box and the categories below.

Note, some (3 of 5) of the students use Google to find university information.

Some good aspects for the current search:
- Good and logical that the facets are positioned on the left side.

Some bad aspects for the current search:
- Name of the facets, and it was confusing with various tabs and facets. There is no focus on the page.

Chapter 5
Development of a New Interface Concept

The study of literature, the design process, and the user studies have all been contributing to the development of ideas of how a new interface concept might look like.

Mock-ups (simple prototypes) are based on user studies and shows how the search interface can be improved.

5.1 The Design process
The design process is not linear, it was adapted to this study and includes four steps:
- Identifying needs and Establishing requirements, developing alternative designs,
- building interactive versions of the designs, and evaluation of designs.

The following section below describes and shows the various steps in detail.

5.1.1 Identifying needs and establishing requirements
One has to know who the users are and what they need in order to design a suitable interface.

The identified needs was then the basis for product specifications, where all the requirements that the product must fulfil are listed.

Analysing the current interface to identify user needs. The identified needs from the user test are used when creating new ideas. Norman's expert evaluation method was applied on UU’s interface, the results indicate a direction for the design.
5.1.2 Developing alternative designs, concepts

This step contains the main design work and ideas in order to reach the requirements. The activity was chosen to consist of a conceptual design phase. The conceptual design includes how the product should behave and look like, i.e. it is used to create the product conceptual model.

A brainstorming session was held at the Findwise office. It is a creativity technique to find new spontaneous ideas from others that contribute to your own ideas and thoughts. It helps you think outside your head with help of others. Six persons wrote down their ideas on post-it notes. Some techniques had been prepared to trigger their ideas. One of them was that they should think like a five years-old child.

Figure 5-1: Some of the idea's from the brainstorming session, presented on post-it notes.
- From the generated ideas some concept proposals are developed and then presented, also discussed with two industrial designers.
- Some hand-drawn sketches were made to communicate and try out the concepts.
Below, in figure 5.2 some of the sketches are shown.

5.1.3 Building interactive versions of the designs
This step is about determining which concepts will be further developed and tested. The design is divided in two sprints.

Some design versions were created, and later tested on users through interaction. Mock-ups (simple prototypes) were made with the mock-up tool Balsamic and Illustrator, printed on paper and communicated to the users. The participant’s response was recorded to identify negative and positive aspects of the design at an early stage, called informal usability testing. During both sprints the mock-ups were printed on paper to make it easier to discuss and let users suggest changes.

Sprint 1
During the first sprint two prototypes were designed. Two design concepts were selected to be further developed and tested.

Low-fi prototype 1 (P1). P1 focus was to get an overview of all available courses depending on which term/period of time that is selected. Below in figure 5.2-5.3, are two different versions of prototype 1.

![Figure 5-2: The first version of prototype 1.](image-url)
Two user tests were performed on the prototypes (P1 and P2). The first test showed that the user had troubles in understanding the different blocks the term was divided in. It showed that the students at Linköping University divided both spring and fall semester, in-
to 4 blocks each, thus a whole year consists of 8 blocks. This gave thoughts to share the fall semester and spring semester in another way. Wanted to add an overview with clickable links so you can see where you are and the choices you made. Then prototype 1 and prototype 2 were further iterated.

**Sprint 2**
During sprint 2, one more concept was further developed. And at the end of the sprint one mock-up, which seemed to be most suitable for the user group was selected.

The sprint was started by writing down three keywords for each mock-up and gave them suitable names. This was to get a feeling for each design and also remember their first core values and hold on to them during the iteration.

In low-fi prototype 3 (P3), there are many different approaches, choose what you want to search by filter by choosing different categories. Further it was named the “Knowledge tree”. The name, knowledge tree is a good metaphor. Also, one gets a good overview of the choices in the tree.

![Prototype 3](image-url)

**Figure 5-5:** Prototype 3 is called the knowledge tree. Drag and drop the choices in the three.

When a user test was performed on the three Mock-up’s, each was evaluated with two users. One of the participants commented that a good solution might be to combine ideas from the different prototypes. That idea inspired prototype 4.

Low-fi prototype 4 (P4) was created last. Three keywords were given to P4. This mock-up offers some different approaches to find courses, one can see history, like the choices one made, and there is a good overview of the options. It was named the “Accordion”.

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A user test was performed on the last mock-up. The feedback was positive and after minor changes it was evaluated once again.

5.1.4 Design evaluation & follow up

In the process of choosing the final mock-up, I returned to the list of user aspects and needs that emerged from user testing.

There are some aspects of why P4 is best fitted. One of the issues discussed with users was that the facets might be linked together with the search box. In P4 the search box and facets are in the same box. The small arrows also indicate further information. Furthermore, in P4 the overview of the choices is prioritized, and the choices one has made are clearly presented.

The users wanted better contrast to get a hint where to focus. In P4, before choices are made the “accordion” is closed. Later when the user made some choices, the “accordion” is widespread. But it is only the last selection that is clear coloured and the rest of the steps are faded out, which helps one to keep focus on one part of the interface.

It is preferable to have some kind of history to help the user's remember which choices they made. In P4 you can see all the choices you have made.

You get clear feedback through the accordion. When you make any choice in P4 you get direct feedback that you accomplished something.

P4 was chosen as the final design because it felt like the most useful and customised from what was found in the evaluation of the current interface. Furthermore, the interface was tested with scenarios that would cover most of the students within the user group, and P4 passed the scenarios (described in next section). Even when Norman's principles were compared with P4, it was considered to meet the design principles. Another method to evaluate P4 was with the guidelines for search (Hearst, 2009):
To offer efficient & informative feedback, and balance user control with automated actions. Further on reduce short-term memory load and provide shortcuts. Also reduce errors and recognise the importance of small details. And recognise the importance of aesthetics, this is kept in mind, but since it is a sketch of an interface one cannot really fulfil this point.

5.2 The chosen concept

Evaluating the new design

Besides using the guidelines for search, another approach was used: scenarios. Based on the conducted user studies, three search scenarios were defined and applied. Each scenario is illustrated in P4, to show how the solution works.

Scenario 1, the student is interested in a specific course, knows the name.
Scenario 2, the student is interested in a particular subject area.
Scenario 3, the student wants to fill out the student credits, are willing to read any course at a specific time.

Norman's design principles applied to the chosen design proposal:

Some of Norman's design principles described in “the design of everyday things” are applied to the final design, this just to check if the requirements are met:
- Affordance, ex: the small arrows indicate that further information is available. The arrows show where you can press.
- Constraints, only showing information about one course at the time.
- Visibility, all the functions, which can be performed, are visible.
- Feedback, immediate feedback when you “click” anywhere (clickable areas) in the interface.
- Consistency, all the hits look the same, and where you can find information look the same.

The new interface design

• The search box: the size, the placement is to the left, and the same function as before (in the current interface).
• Search response: The hits are presented in a list, and this is proved, through literature review, and user test to be what users prefer.
• Faceted navigation: These categories can be chosen to fit the available courses at the university. The ones in the design proposal is an example of how it could look like.
• Guidance Box: A description of what is possible to do for users and new beginners.
• Overview: It is a chronological order.
• Focus: The different steps are faded out in grey, only the last choice is clear with good contrast, in order to control the focus for the user.

You can see the final version of the interface concept in the figures 5.7 and 5.8.
Figure 5-7: The "Start page" of the final version of the design proposal.

Figure 5-7: The final prototype, showing the second scenario, where one is looking for specific subject area.
Chapter 6
Discussion and Conclusions

One thing I learnt from experienced interaction designers is to not let the user decide in the end, because they are not the experts, and they all have different opinions. I chose the solution that best suits the user needs, the needs found by performed user tests on the current search solution of UU.

6.1 Discussion of used techniques
This work has led to the use of several techniques and methods. Trade-offs have been made in the choice of methods since there are many to choose from and there is limited time to work.

Discussed below are the techniques and methods used in the work, and attempts have been made to evaluate and analyse them based on the observed benefits and support for the work and the results they have contributed.

The choice of methods, Norman evaluation, interview, observation with think-aloud technique, and survey, were well suited for the purpose of finding many usability issues concerning UU’s search engine interface. The methods and the design of the methods were chosen to complement each other.

The “think aloud” method used during the observation may be bad and disturbing for users. To think aloud and to tell what you are thinking of during observation is not a natural thing. The users may become aware of what they do and act differently, this can affect the results of the user test (Helen Sharp, 2007). In this study it was preferable to let the participants think aloud because it led to some comments about the usability.

The use of the brainstorming technique when designing a new product appeared to be a good method in this case, because it generated many good ideas and inspiration.

Furthermore, to start by evaluating existing systems and then propose a new design was a good way of learning about users and also a good way to involve them in the development work.

Another evaluating technique, Normans design principles is a good way to get an expert opinion, and it is also good to evaluate with specified user scenarios to see if the interface holds a certain standard.

As for the user interaction satisfaction questionnaire, users might be affected negatively because the first statements were negative. But if you look overall the test has more positive than negative statements. But perhaps, next time one should put every other positive and negative.

6.2 Discussion of the new interface concept
In Low-fi prototype 4’s interface one can choose to use faceted navigation (categories). The categories were, however, not evaluated in terms of what is best suited the specific search. The categories are probably different for each university, and this is just an example of what faceted navigation could look like and be placed. Before taking the design concept further the categories for the facets must be evaluated to match the University's variety of courses.
The final solution P4 is a search browsing solution; navigating or browsing the web and selecting links or categories that show pre-defined information. In many situations it is considered to be less mental work to browse (Hearst, 2009). There have been discussion of which one is the best suited in search solutions, it depends on what you want. When one know the user needs and goal with the solution, one can decide the best fitted.

Due to schedule constraints, only three users evaluated the final mock-up design, though it would probably be better if the solution were discussed with at least five users (Nielsen, Why You Only Need to Test with 5 Users, 2000).

6.3 Future work
The next step for the mock-up would be to make an interactive prototype and add some colours and graphic design aspects to it, to make the design more appealing and give it an authentic feeling. And then perform another user test, a test where the participants could show how they really act (during an observation). But because of the time limit there was not enough time to do that.

Many thanks to people who helped me!
Bibliography


## Appendix

Below, is the User Interaction Satisfaction Questionnaire.

For each word below, please indicate how well it describes the site:

<table>
<thead>
<tr>
<th></th>
<th>Strongly disagree</th>
<th>*</th>
<th>*</th>
<th>*</th>
<th>*</th>
<th>*</th>
<th>*</th>
<th>*</th>
<th>Strongly agree</th>
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</thead>
<tbody>
<tr>
<td>1. confusing</td>
<td></td>
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<td></td>
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<td></td>
<td>Strongly agree</td>
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<td>2. frustrating</td>
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<td></td>
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<td></td>
<td>Strongly agree</td>
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<td>3. interesting</td>
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<td>Strongly agree</td>
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<td>4. useable</td>
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<td>Strongly agree</td>
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<td>5. unpleasant</td>
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<td>Strongly agree</td>
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<tr>
<td>6. I feel in control when I am using this site.</td>
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<td>Strongly agree</td>
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<tr>
<td>7. This site needs more introductory explanations.</td>
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<td></td>
<td>Strongly agree</td>
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<td>8. I find this site useful.</td>
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<td></td>
<td>Strongly agree</td>
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<td>Strongly agree</td>
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<tr>
<td>9. Everything on this site is easy to understand.</td>
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<tr>
<td>10. I get what I expect when I click on objects on the site.</td>
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<tr>
<td>11. I feel efficient when using this site.</td>
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<tr>
<td>12. Overall, I am quite satisfied with this site.</td>
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The User Interaction Satisfaction Questionnaire after evaluation.

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<th>Rating</th>
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<td>1. confusing</td>
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</tr>
<tr>
<td>2. frustrating</td>
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</tr>
<tr>
<td>3. interesting</td>
<td></td>
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<tr>
<td>4. usable</td>
<td></td>
</tr>
<tr>
<td>5. unpleasant</td>
<td></td>
</tr>
<tr>
<td>6. I feel in control when I am using this site.</td>
<td>3</td>
</tr>
<tr>
<td>7. This site needs more introductory explanations.</td>
<td>2</td>
</tr>
<tr>
<td>8. I find this site useful.</td>
<td></td>
</tr>
<tr>
<td>9. Everything on this site is easy to understand.</td>
<td></td>
</tr>
<tr>
<td>10. I get what I expect when I click on objects on the site.</td>
<td>3</td>
</tr>
<tr>
<td>11. I feel efficient when using this site.</td>
<td>3</td>
</tr>
<tr>
<td>12. Overall, I am quite satisfied with this site.</td>
<td></td>
</tr>
</tbody>
</table>