The User Experience of a University Student Application:

A Student Initiative of Improvement to the LiU-app

Linn Gustafsson, Julia Lindström, Katarina Muts, Sara Rosén, Zakarias Subeh & Wilma Tengfors

Abstract

This research paper investigates user experience through opinions of students' at Linköping University on the university's student application and of the new version, created as a prototype. Based on students' opinions through surveys and contextual interviews, a lack of usability pervaded when it comes to certain functions in the app; *book room, search location, view schedule* and *time schedule of the campus bus*. Based on the students' inputs as well as UX- and psychological principles, a prototype was developed with the aim of improvement. The prototype was evaluated through usability tests measured with both qualitative and quantitative methods as well as a heuristic evaluation. The qualitative and quantitative result of the prototype shows for the most part a positive user experience and suggests that the prototype was perceived to be better than the current student application.

Introduction

Preece et al. (2016) has described the world as increasingly affected by mobile phones. Smartphones are used for virtually everything, such as business, pleasure, communication and navigation. When designing an application it is important to make it easy and fast, otherwise few people will feel like they have the time to use and understand it. Ramirez-Corerra et al. (2019) explained the importance of aesthetics for the users when interacting with a system. A strong correlation is discovered between users' opinion on the interface aesthetics and the usability of the system. This leads to that good design can diminish the gap between a user's expectations and the user experience.

The idea of Linköping University having a mobile application for the students came from the former headmaster of Linköping's University and was influenced by a similar application from a university in the UK (A. Fredin, personal communication, April 12, 2022). It was considered useful for the students to have an application due to the extensive mobile use these days. The application, named LiU-app, was developed in 2015 and was launched in 2016. The LiU-app was developed by the university's IT department, with consideration taken to the students' wishes for certain functions, such as registering for an exam or searching for a specific building or classroom. The purpose of the LiU-application was to gather all the tools and information a student may need to simplify their everyday student life.

Purpose of the study and research questions

The aim of the project was to investigate student's user experiences and opinions of the LiU-app and improve it based on their inputs, as well as UX- and psychological principles. This was studied with the following research questions:

- What are the students' opinions of the current LiU-app?
- How can the application be improved based on the students'

opinions, UX principles and psychological theories?
- What are the students' experiences of the developed prototype?

Theoretical background

Mental models

It is common to encounter the feeling of automatically knowing how different objects work or should be working, regardless if you have interacted with the object before or not. According to Arvola (2020), the ability to have insight about objects functionality or how you accomplished something is also the ability to have mental models.

Danielsson (2016) has written that without the ability to create mental models we would be forced to follow exact instructions in different approaches and memorise the steps until next time we need them. Since we can form mental models we already have an expectation on the system. The human mental models are though often incomplete and sometimes even wrong in different ways. Humans have in general a very simplified view of complex systems, and therefore think that they know how the system should work. The mental models can still often help you and guide you right in interacting with a technical system, and help you learn more about it.

Selective attention

Selective attention is our brain's ability to actively decide where to direct attention. The theory of selective attention has been visualised and described as a bottleneck-concept. The foundation of this comparison is the fact that we cannot process all presented stimuli at the same time (Stevens & Bavelier, 2012). Treisman (1964) described how one's brain selects one of all messages that are absorbed and starts a further processing of that while the rest are ignored. All the stimuli are subjects to be presented to what is called a *sensory buffer*, which is where the irrelevant stimuli are filtered out. This sensory buffer itself has an unlimited capacity, which means that while we cannot focus on an unlimited source of information at once, we still have the ability to receive an unlimited amount of stimuli as input, before the sensory buffer filters out what is not important. The filtering system is effective to prevent information overload, but it is beneficial to have that in mind when developing a technical system.

Cognitive Bias

Arvola (2020) explains that there are systematic thinking errors that occur when processing or interpreting information called cognitive bias. In UX design one relevant cognitive bias is called *The Von Restorff Effect* and is described by Chee & Gho (2018) as the isolation effect. It is a psychological principle stating that when multiple similar stimuli are presented together, humans are more likely to remember the stimuli that differ from the others. Another bias that must be considered in UX design is *the serial position effect* and is described by Kelly et al. (2019) how an object's position in a sequence affects our memory. If an object is positioned in the beginning or in the end of a sequence it is more likely to be remembered than the objects in the middle.

UX-laws

Gestalt laws are a set of principles or rules used to describe how human perception interprets its visual information in the environment. The human mind often organises and sometimes group together similar elements and simplify complex images. Every interaction the user has with a certain element will develop the user's expectations of the function for similar elements. The kind of characteristics that are considered to be related are, for example, the shape, the colour or size of the UI elements (Wen et al., 2010).

Human memory has limitations and according to Miller's law the limitation of keeping objects in the working memory is 7+-2 items. If we are subjected to more than around seven objects to remember, most people will fail and miss information that might be important. When designing user interfaces, it is therefore salient to avoid cognitive overload and follow Miller's law (Danielsson, 2016).

Hick- Hyman's law are formulated from the theory that the more stimuli a person has to choose between, the longer it will take to make a decision, and also correct decision (Danielsson, 2016).

Method

Data gathering methods

To gather data for the prototype, and to research how students were using the already existing LiU-app, the research group decided to conduct contextual interviews on 10 students at the university. The participants were recruited through convenience sampling and the purpose was to study the user patterns of the LiU-app. During the interview, the test subject was instructed to use the application in the same manner as they normally do. They were in addition to this encouraged to think out loud, and to comment on every step they took throughout the interview. By doing this, it was possible for the research group to study the thought process of the student and to get direct feedback from the student on their positive and negative thoughts about the application.

A second data collection method was a survey about usage of the LiU-app. The survey was distributed to students via student newsletter, the student webpage, the home page of the current LiU-app, facebook posts in different groups and via direct communication to other students. The purpose of this was to reach as many students across different faculties and programmes as possible. The survey consisted of a total of 24 questions regarding the user experience of the LiU-app, wishes of new functions and questions about the students. This survey was designed in consultation with the developer of the existing LiU-app.

Prototype design

The project group developed a prototype in Figma which is a web based tool for developing prototypes for applications (Figma, n.d.). When developing the prototype, the aim was to improve on the functions and user interface from the already existing LiU-app, where the students had presented complaints. Because of this, the data from the survey and the contextual interviews were crucial to consider when developing the prototype. Psychological theories and principles in UX design were also considered when designing in Figma.

Usability testing

10 usability tests were performed with students from Linköping University recruited through convenience sampling. The participants tested the prototype on an Iphone 7. The participants were given four different scenarios with different tasks and subtasks which were randomised for every participant, except for the first scenario (home page). This was always the same, since the remainder of scenarios needed the user to be logged in. For every scenario the time was measured from the moment the participant touched the application until the scenario was completed. Every usability test was also recorded with stop-motion (without sound) on a phone, which made the team able to re-watch the test to calculate the task success of every scenario and make a profound analysis of the result. The participants were told to loudly vocalise every step they took to achieve the goal of the scenario and describe their thinking process.

After finishing each scenario and the usability test in whole the participants

answered a couple of questions on a digital survey on Google Forms. It was about the scenario in particular and their experience with the prototype.

Results

Contextual interviews

The analysis of the contextual interviews with the KJ-method resulted in eight teams, with five of these containing two or more families. These highlight the main points regarding the current LiU-app as brought up by the participants. The main themes were:

- Positive features
- Negative features
- Difficult elements
- User requests
- Areas of application
- Default settings
- Recognition
- Infrequent users

Student survey

A total of 84 students answered the survey, where two stated that they had already received their degree and therefore were excluded from the results because the study focuses on currently attending students. The average participant was enrolled in the bachelor's program in cognitive science.

Respondents attended a total of 38 different programs and separate courses. The majority used a mobile device with IOS as an operating system. Out of the 82 students, four did not use the application. The application was usually used a couple of times a month where the most popular were *Look at my exams, register for exams, look at results* and *book rooms*

The general opinion of the LiU-app received an average score. The score was 2.8 on a scale from one to five. The overall aesthetics of the application scored 2.7 on a scale from one to five. The navigation of the application fared better and received an average score of 3.4 out of five. The feedback received from doing an action also received an average of 3.4 out of five.

Overall, they represent the users' usage of the different functionalities of the app such as course evaluation has 38 no opinion answers. The functions with the most *very good* were *my exams*, *results*, and *today's exams*. On the other hand, the functions with the most *very bad* were *campus map* and *schedule*.

Quantitative result from usability test

Task success

The result of the binary success measurement showed that the participants had the most difficulties with adding shortcuts. Only 50% of the participants managed to complete the task. The second most challenging task was to register for an examination where only seven participants (70%) managed to complete the task. The third worst success rate was for adding notifications, where eight of the participants (80%) succeeded.

For the tasks *Sign In*, *Book Room* and *Check Schedule*, nine participants (90%) succeeded. All participants (100%) succeeded in the tasks Search location and Search trip.

Scenario completion time

The result of our *time-on-scenario* data showed that the average time spent on each scenario was very unbalanced. The most amount of time the participant spent was on Scenario 1 (Homepage) with an average of 212 seconds (3 minutes and 53 seconds).

In Scenario 2 (Campus bus) the average time spent was 148 seconds (2 minutes and 46 seconds).

In Scenario 3 (Book room) the average time spent was 133 seconds (2 minutes and 22 seconds) and in Scenario 4 (Schedule) was 87 seconds (1 minute and 45 seconds) the average time spent.

The percentage of participants who completed scenarios according to its anticipated time varied as well. The highest percent of participants (70%) completed scenario 2 accurate to its anticipated time and the least amount of participants (10%) completed scenario 3 according to the anticipated time.

Qualitative result from usability test
The qualitative analysis of the user tests resulted in eight teams, with all of these containing two or more families. These highlight the main points brought up by the participants during the user tests, where all but one (opinions of the LiU-application) were in regard to the prototype. The main themes were:

- Navigation
- Positive feedback
- User requests and suggestions
- Feedback from the application
- Negative feedback
- Limitations of the prototype
- Ambiguity
- Opinions of the LiU-app

Discussion

The results from the contextual interviews showed a majority of families in the themes *negative features* and *user requests*. One negative feature that was expressed from the interview objects was *negative design*, and it also appeared in the theme user request, as *more appealing design*. The project group had in the initial work with the project discussed the design of the application and came to the conclusion that the design and user interface was not aesthetically appealing and that some improvement was necessary for the prototype. In accordance with Miller's law (Danielsson, 2016) and after reviewing complaints about the overwhelming amount of objects in the menu, the number of menu headings was decreased in the prototype.

The survey showed that the general opinion was neutral toward the application. One of the reasons for the moderate result on aesthetics could be because a majority of respondents used an IOS device, which lacked colour. Today companies release frequent updates and changes to the look of the applications, so the absent ability to update can contribute to the negative opinions. Similarly, the userbase's needs could have changed from 2016. One thing that is appreciated is the ability to register for exams. It can also be seen that the majority of the users access the app a couple of times a month or a couple of times in a year, which is around the times one would register for exams. This points back to one of the original reasons for the application's development, which could suggest more thought was put in those functionalities.

The tasks in the usability test that had the best success score were all functions that already exist in the LiU-app but in a new format which might have made them easier for the participants to recognise and use since it already matches their mental models. The lower task success for the other three tasks (add shortcuts, add notifications, register examination) could be explained by ambiguous written scenarios with a few subtasks. When participants were doing scenarios with subtasks many were uncertain if they had completed the whole task.

Another aspect of low success rate was due to limitations in the flow of the prototype. An example of that was the adding of shortcuts. One could leave settings with added shortcuts without actively adding them which perhaps made the task unnecessary for the participant to do. A last aspect discussed for low success score could be the prototype's unclear headings. The settings for shortcuts were under the heading *Startpage* whereas notifications were under *Notifications*. The unclear headings combined with the problems of the flow could possibly have affected our lowest task success rate for

the adding of shortcuts. The adding of shortcuts as well as the adding of notifications were both new implemented functions of the app which could also mean that the participants had greater difficulties of understanding where these functions were to be made.

The results of the completion time showed a diverse result of the mean time on each task. The reason for the different completion times for each scenario is that they had different amounts of sub-tasks. The 95% confidence interval also showed a large variability in the time within each scenario. By contrasting each participant's completion time on each scenario to its anticipated time we got results to better understand the efficiency of the functions. These results varied a lot, which is believed to be because of difficulties with the flow in the prototype. The reasoning behind this is that the anticipated times for the usability tests were mainly based on one pilot test which was executed very smoothly. There were also some technical difficulties which affected the testing. Other aspects which might have affected the results of completion time is the way the coordinators measured time.

Conclusion

A prototype was developed based on the already existing LiU-app. New functions and features of the application, as well as already existing improved functions and features have been investigated through surveys and contextual interviews with the students of Linköpings University. Psychological theories and UX-principles have also been implemented. The survey showed the students' general opinion on the LiU-app was 2.8 out of five. When the prototype was finished multiple usability tests were conducted to examine the usability of the new interface. The overall score on the usability test for both quantitative and qualitative data showed that the user preferred the prototype over the current application, although there was room for improvements.

Recommendations for future modifications and improvements on the LiU-app would be to follow these opinions to give the students the best user-experience as possible.

References

Arvola, M. (2020). *Interaktionsdesign och UX: om att skapa en god användarupplevelse* (2nd ed.). Studentlitteratur.

Chee, Q. W., & Goh, W. D. (2018). What explains the von Restorff effect? Contrasting distinctive processing and retrieval cue efficacy. *Journal of Memory and Language*, *99*, 49–61. https://doi.org/10.1016/j.jml.2017.11.002

Danielsson, M. (2016). *Introduktion till teknisk psykologi*. Studentlitteratur.

Figma. (n.d.). https://www.figma.com/about/

Kelly, M. O., & Risko, E. F. (2019). Offloading memory: Serial position effects. *Psychonomic Bulletin & Review*, *26*(4), 1347–1353. https://doi.org/10.3758/s13423-019-01615-8

Ramirez-Correa, P., Rondán-Cataluña, F. J., Arenas-Gaitán, J., & Mello, T. M. (2022). Is your smartphone ugly? Importance of aesthetics in young people's intention to continue using smartphones. *Behaviour & Information Technology*, *41*(1), 72–84. https://doi.org/10.1080/0144929X.2020.1795259

Sharp, H., Rogers, Y., & Preece, J. (2019). *Interaction design: Beyond Human-Computer interaction* (5th ed.). John Wiley and Sons.

Stevens, C., & Bavelier, D. (2012). The role of selective attention on academic foundations: A cognitive neuroscience perspective. *Developmental Cognitive Neuroscience*, *2*, S30–S48. https://doi.org/10.1016/j.dcn.2011.11.001

Treisman, Anne. M. (1964). SELECTIVE ATTENTION IN MAN. *British Medical Bulletin*, *20*(1), 12–16. https://doi.org/10.1093/oxfordjournals.bmb.a070274

Wen, G., Pan, X., Jiang, L., & Wen, J. (2010). Modeling Gestalt laws for classification. *9th IEEE International Conference on Cognitive Informatics (ICCI'10)*, 914–918. https://doi.org/10.1109/COGINF.2010.559977